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## INDICATIONS OF THE ANTIQUITY OF THE INDIANS OF NORTH AMERICA, DERIVED FROM A STUDY OF THEIR RELICS.

BY DR. C. C. ABBOTT.

THE stone implements of the Indian long since lost in the chase, broken in the conflict, or discarded when metals were introduced, as we now gather them up singly or by the score, seem to give us no clew to those most interesting of all questions connected with them, When were the first of these stone implements shaped? How many centuries have passed since the Indian first reached our shores, and armed himself with these rude weapons?

That isolated specimens of relics, however occurring, should be valueless in this respect is quite natural, considering the many circumstances which might arise to place single implements in the most unlooked-for places; but on the other hand, when an opportunity is had of securing nearly the entire series of relics left by a departed race in a single locality, and of examining them, not simply on the shelves of a cabinet, but as they lie upon and in the ground, then there is an opportunity afforded of gathering facts concerning them other than the extent of their variation in shapes and uses; and particularly may we learn something of the relationship they bear to each other with reference to the vexed question of their antiquity.

In previous articles in this journal (vol. vi.) I have briefly called attention to the vast numbers of relics found in Central New Jersey, and drawn a distinction between the ruder and the more elaborate forms, considering the former strictly paleolithic implements; but that from this stage of culture to that of the polished stone age there had been an unchecked development, a gradual merging of the one into the other condition. Subsequent

studies have led to a modification of this view, and a separation of the two classes of relics as traces of distinct peoples. This subject I propose to dwell upon at some length in a subsequent article, and desire to call attention now to what I believe to be positive indications of the very great length of time during which the Indian occupied New Jersey, as derived from the study of thousands of stone implements gathered by myself.

Unless some very marked geological change occurred, obliterating every vestige of the former surface of the country, lost paleolithic implements would naturally occur, scattered about, and what more probable than that men of a later period should occasionally pick up, preserve, and utilize them? The difference between a paleolithic and a neolithic flint hatchet is not as great as that between an ancient stone and a modern metal hammer; and Nilsson[1] refers to a stone hammer of undoubted antiquity being long used by a carpenter, who had put it to uses similar to those of its prehistoric owner. When, therefore, among true Indian relics that occasionally are found lying together as the series described by the writer in this journal,[2] that marked the site of a "homestead of the stone age," there happens to be "rudely chipped implements" associated "with some of the very finest wrought stone weapons and arrow-heads," it is not necessary to conclude that the latter were made at the same time as the others, for we are not sufficiently familiar with the every-day life of the stone-age Indian to assert that he could have found no use for these rude productions of his predecessors, on the one hand, or that he did not gather them up for use, or work them over into better forms, when they happened to be met with. Inasmuch as these rude relics that are *intimately* associated with newer relics invariably exhibit a greater degree of weathering and decay than accompanying implements of the same mineral, it is not difficult to separate them; and whatever the use to which they may have been put, it appears certain that they were occasionally gathered — veritable relics of a departed people then — by the Indians for some practical purpose.

As arrow-heads are the best known form of Indian relics, and as they certainly outnumber all other forms, and are abundant frequently where no other pattern is found, they afford by reason of their numbers excellent opportunities for determining various questions concerning the condition and degree of culture of the

[1] Stone Age in Scandinavia, 2d ed., p. 69.

[2] Vol. vii., p. 271.

people using and making them. I will therefore first refer to them, in endeavoring to point out the indications of the antiquity of the Indian.

On examining a complete series of arrow-heads from one locality, we find that whatever mineral was available was utilized in their manufacture, and on the sites of arrow-makers' workshops not only is there a vast accumulation of chips of the more popular minerals for arrow-heads, but quantities of water-worn pebbles from the river and brook beds, which have been split in two, or otherwise tested, to see if by the first fracture they gave promise of being available. Again, certain minerals seemed specially adapted for a given pattern of arrow-points, and were used almost exclusively for it. We have here certainly an unquestionable indication that the art of arrow-making had been progressive, whether the progress was made while the Indians were in this country, or acquired previously. In either case, the progress had been made; and when we find rude arrow-heads in considerable numbers, of plain patterns, scattered singly about fields and forests, it is quite conclusive that these are the forerunners of the former, — the elaborate jasper specimens, — and that the progress in the art of arrow-making was acquired during the Indian's occupancy of this territory. As this was very slow, the date of his arrival reaches back into strictly prehistoric times.

Having seen that different minerals were used by the Indians in arrow-making, let us consider in detail what evidence there is of great improvement in the production of these implements. The poor specimens of themselves do not simply indicate, as might be claimed, that they are the work of beginners in the flint-chipping art, for they are found in such localities and under such conditions far too often for one not to see that they are the weapons of an earlier time than are the more elaborately wrought forms found near them. In a country overgrown with forests, where there is annually a vast deposit of dead leaves, there necessarily is a steady increase in the depth of the soil by the deposition of a thin layer of vegetable mold. This increase I believe to be about one one hundred and twenty-eighth ($\frac{1}{128}$) of an inch per annum, in beech, oak, and chestnut woods. If on examination of the undisturbed soil of such forest tracts we find jasper and quartz arrow-heads at a depth of ten inches which are large, not acutely pointed or symmetrical, and of the simplest patterns, as the leaf-shaped or triangular; and smaller, symmetrical, stemmed, barbed, acutely pointed specimens two or three inches deep, as a

rule; then I submit it is quite certain that the former are about thirteen centuries old, and the latter ranging from two and a half to four centuries. This is what really occurs in New Jersey, and in part I rest the claims of the Indian's antiquity thereupon.

Again, in the river flats that are yearly and semi-yearly overflowed, this same condition obtains; and the deeper in the deposits — which are constantly increasing in depth, and have been since the river assumed its present dimensions — that we find these arrow-heads, while mineralogically the same with the very finest, they show less skill in the workmanship. This applies, as we shall see, to all other forms and varieties of weapons, domestic implements, and ornaments; and gives us evidence of an improving savage, who subsequently reached a somewhat higher stage, beyond which he has no capability of going.

The grooved stone ax is a form of Indian relic that is a marked feature of the stone weapons of the Indians. They are moderately abundant everywhere, and tens of thousands are probably still lying in the soil. I have knowledge of one field of twelve acres from which have been already gathered one hundred and thirty specimens, and every plowing brings others to the surface. These axes give us the same evidence of gradual improvement I have pointed out as existing in the case of arrow-heads. Weapons of this pattern are strictly a neolithic form, the groove making it a polished or ground stone implement. They are never made of "flaking" material, but are pecked or hammered into shape, then smoothed or polished. In the apparently more ancient graves, these axes are pebbles from the river bed, that have acquired something of an ax shape. The edge was first hammered and then smoothed by rubbing, and a roughened circle made about it, at or near the middle of the stone.[1] Derived from such a rude relic we have, in later times, very carefully grooved specimens, many with the groove faced with high ridges, that give the depression a double depth. The edge is a marvel of accuracy in tool making, being as correctly formed as in the most elaborate steel ax of the present time, although of course not as thin in the blade, and as sharp. These perfect stone axes occasionally are turned up in plowing, but most frequently are found in graves, associated with finely wrought jasper spears and other weapons; but never in the oldest graves, or the deep, undisturbed soil. Examination of the mud of the river flats, and

[1] Stone tools, as hammers, whetstones, etc., indicative of the method pursued in making these and other weapons, are very abundant in some localities.

other localities where analogous changes are in operation, yields precisely the same results, as to the degree of excellence of workmanship in comparison with the depth at which they occur, as in the case of arrow-points, and I draw the same conclusions in the one instance as in the other.

Before referring to pottery and its bearings on this question, I desire very briefly to call attention to an interesting point connected with every large series of stone implements from a given locality; that is, that there are very many forms of such relics that are never found except of advanced workmanship. In proportion as the implements of the Indian were of primitive make, they were few in forms, one form answering for a variety of purposes; but advance in the art suggested variations in shape to meet particular uses; and so, in proportion as we find a specimen of a specialized shape, we find it elaborately wrought and of fine material. A rudely nicked flint flake was never yet met with that there is a shadow of reason for believing answered as a saw, and was thus used. The wavy, saw-like edges of many spear-heads doubtless suggested that tool; and carefully toothed, thin flakes of jasper are frequently found,[1] that unquestionably were made for sawing, and for this use only. The large "scrapers," especially those occurring in fresh-water and marine shell-heaps, are not generally very carefully shaped, and the majority are made of easily worked material. Like arrow-heads, they give evidence of gradual improvement. With the ruder shapes of this implement, just referred to, there are never found associated the delicately chipped, diminutive "scrapers," as they are usually called, which were certainly intended for other uses than cleansing skins. These miniature "skin-dressers" were doubtless suggested by the typical scraper, and so are of later origin. They are met with upon the surface of the ground, and, whatever their use, are simply another instance of what I stated concerning arrow-heads and axes. If correct in my conclusions with reference to Indian relics as a whole, the bearing of the above remarks regarding specialized forms, such as described, on the question of the antiquity of the Indian, is obvious.

There is no one class of relics by which the general advance in art can be estimated better than that of pottery. This, in a more or less fragmentary condition, occurs associated with neo-

[1] In a fresh-water shell-heap of limited dimensions, situated on the bank of a small creek, has been found a jasper saw seven inches in length, and near it several tibiæ of deer that had evidently been cut in sections with this implement.

lithic stone implements wherever found, either on the surface, in the soil, or buried in graves. This association is a reliable guide to the age of accompanying relics, especially when met with in graves, for superior ware would be chosen to contain the food buried with the body. I have invariably found in the graves which from indications irrespective of their contents gave evidence of considerable antiquity, that the contained relics agreed with the external evidences; and especially is this true of the pottery. It is very coarse and free from all attempts at ornamentation when associated with coarse, unskillfully chipped weapons; and elaborate, highly decorated, — by figures of varied patterns, not colored, — and fine in its composition when found in graves containing carefully wrought, artistic jasper spears and arrow-points, and highly polished, symmetrical celts and axes. The same obtains with pottery that has been long lost, and deeply buried by the accumulating soil of periodically submerged lands, when compared with that found nearer and upon the surface.

The rude pottery, and evidently the older, is simply clayey earth with no admixture of foreign matter other than what has been accidentally incorporated, such as small pebbles and fragments of wood. It is easily broken, free from ornament, and, I judge, sun-burnt only.[1] Always thick, and usually uneven, vessels of such rude make could have been of but limited use, and, judging from the fragments, were always small round or oval bowls, never contracted at the opening as the majority of cups, vases, and urns of later times are. The finer and later pottery is made of carefully selected clay, is mixed with finely pulverized mussel shells, is comparatively thin, of uniform thickness, and often very elaborately decorated with curved lines, dots, zig-zags, and parallel lines, singly or combined. Some fragments that I have gathered give grounds for believing that by varying the proportions of the ingredients of the mixture the maker could determine the color, as some of these fragments are of a bright brick-red color, others of a delicate pearl tint, and a third variety of a deep, dark purple. A careful comparison of a large series of specimens gathered from a single neighborhood, made in connec-

[1] From circumstances to which I cannot more than allude now, I am led to believe that the first pottery was baked by being plastered over one half of a large oval stone previously heated. The heat from the stone and exposure to the sun resulted in an unequal burning, the inside of the vessel being harder than the exterior surface.

tion with laborious examination of the surroundings and circumstances of the finding of nearly every fragment, — thousands in number, — makes it evident that a very gradual improvement was acquired in this art by the Indians during their occupancy of this territory.

It is unnecessary to give additional facts indicating that the duration of the occupancy of this country by the Indian was marked by a considerable improvement in his condition, as shown by the vast superiority in workmanship of much of the stone-implement work over the rest (exclusive of paleolithic implements), and therefore of necessity that that occupancy was of long duration.

The question now naturally arises, How old are the oldest Indian relics? Only comparative antiquity can be determined. There is no starting-point from which to begin a positive calculation, and I purpose only to show that the antiquity is real and great, without endeavoring to determine its limits by an array of figures. I have already done this in reference to the arrow-heads and axes. There are, however, one or two considerations which have some bearing on this question.

There occasionally are brought to light traces of human habitations which, judging from their contracted limits, were sites of dwelling-places of a single family, or at most a small group of people. The hearth, readily recognized by the charcoal and ashes, the fact of subsistence on animal food by the bones of mammals, birds, and fishes, and the occupation, if an arrow-maker, by abundance of flakes and chips, — all are there. There is nothing wanting to tell the story of the lives of the former occupants of the place. Such habitation-traces, if I may call them thus, differ among themselves in two ways: by the greater or less depth beneath the existing surface of the soil, and by the character of the finish of the contained relics. There is in this case, too, a repetition of what has been thrice stated already, nearer the surface, finer the finish; but the depth of soil above these ancient hearths can, I think, be measured so as to give an approximation to the age of the inhumed relics, whether in the case of deposition from the muddy waters of the semi annual freshets, or of the slow decomposition of forest leaves. The freshets of the Delaware River, occurring usually twice a year, deposit about one two hundred and fifty-sixth ($\frac{1}{256}$) of an inch per annum, and hearths and shell-heaps occur as deep as two feet below the present meadow surface. Such traces of human habitations, if there have

been no other causes in operation to bury them, are about sixty centuries old. If we double the deposit from the water in a given time, even then twenty-six hundred years had passed by since the abandonment of these little shell-heaps and "homesteads" when Columbus discovered the western world; but I believe the former estimate to be much nearer the truth.

I have already referred to arrow-heads which I considered to be about thirteen centuries old. They were far from being rude in workmanship, although not of the most elaborate finish. If we grade a series of a thousand specimens from one locality into three or four, say four, degrees of excellence, such specimens as I have estimated as probably thirteen centuries old will stand as number three in the series. If the acquirement of excellence in flint chipping was uniform, the first and rudest of the arrow-heads assignable to the neolithic Indian dates back twenty-six centuries previous to the specimens graded as number three. All things considered, from thirty-five to forty centuries ago, at least, I believe to be the point in the past when the Indian appeared in what is now New Jersey; but it is by no means improbable that in even more remote times he found his way to the Atlantic coast.

Prior to this were made and used still ruder implements of stone. Deep in strata of sand and gravel underlying the soil, they are occasionally met with. Throughout this essay I have referred to them incidentally as "paleolithic" implements. In conclusion, I will briefly state that from the foregoing remarks it will be seen that one of two considerations must be true. Either the paleolithic implements belonged to the same people as the neolithic forms, or they are the production of a distinct people. When it is remembered that the Indians preserve a tradition of being a usurping people, and credence is given to this fact as stated by them according to numerous authors, the relics now found seem corroborative of such a tradition, and these paleolithic implements, so different from the others in many respects, remain as the only trace of that still older people, the autochthonous race of these shores who were in sole possession when driven away by the incoming Indians, whose own stone implements at the time were but little more elaborate than those of the expelled or subjugated people, but which, as century after century rolled by, became the beautiful specimens of the flint-chipping art which we now find scattered over our hills, along our valleys, and mingled with the pebbles of our forest brooks.

## HAECKEL'S GASTRÆA THEORY.

BY ALEXANDER AGASSIZ.

PROFESSOR HAECKEL has just published in the *Jenaische Zeitschrift*[1] a second paper on the gastræa theory, devoted to answering the many attacks to which it has been subjected. It is fortunately free from the personalities which disfigure so many of Haeckel's productions, and consists mainly of new theories and new interpretations of well-known embryological facts. Haeckel now endeavors by a most ingenious theory to explain the phenomena of segmentation, which (according to him) conceal the original unity of the gastræa in the different classes of the animal kingdom. As Haeckel now presents the gastræa theory it would be difficult to recognize it as he and his followers formerly understood it.

It is unfortunate that Haeckel should feel obliged to coin so many new terms, for unless the reader can throw himself, heart and soul, into Haeckel's position, he will hardly feel inclined to master the delicate shades of meaning which a difference in prefix or termination involves. They undoubtedly contribute to the terseness of the text, but are so numerous that the reader can scarcely be expected to carry in his mind the necessary vocabulary, much of it dating back to the Generelle Morphologie.

Haeckel has made an important admission in going back for his starting-point to the egg (as the opponents of his theory urged), and attempting to trace how far segmentation can be influenced by natural selection; he has of course seen the difficulty, of which all embryologists are aware, of accounting through such a cause for the vital divergence observed in the segmentation of closely allied groups, leading eventually to the same result. It is difficult even in the wildest flight of imagination to frame a theory to account not only for these radical differences of development in the ancestral eggs, living in the same medium, subject to identical influences, but also for their transmission by inheritance. Haeckel's explanation of the causes which have led to the concealment of the descent of the gastrula is that only those embryonic processes which can be traced directly to a former independent ancestral form, and can be inherited, are of primary importance for the recognition of genetic connection, while those embryonic phenomena which are due to adaptation of the embryo or larval condition can claim only a very secondary

[1] Die Gastrula und die Eifurchung der Thiere.

importance. It is by palingenesis and cenogenesis, the terms he applies to primary and secondary embryonic phenomena, that he accounts for the divergence observed in the earlier embryonic stages. Whether we agree with Haeckel or not, his paper cannot fail to be most suggestive, as this is the first attempt to tabulate the early embryonic stages of the egg in the different classes of the animal kingdom, with a view to account for their difference on the theory of natural selection; the more interesting, coming as it does from the investigator who first tested the theory of descent by the monographic study of a great group. It is not our purpose to describe the many subordinate phenomena, either of palingenesis or of cenogenesis, quoted by Haeckel; we merely wish to call attention to the dangerous path he treads when he explains anomalies as falsifications of the record in either time or space. When we have to resort to such devices, no explanation at all is fully as satisfactory.

Armed with this new instrument of investigation, Haeckel carefully compares the different modes of segmentation resulting in the gastrula, to which he had already alluded in his Anthropogenie. He then takes up the same subject for the several classes of the animal kingdom, and treats it with his usual ingenuity, and closes with the phylogenetic interpretation to be assigned to the early stages of embryonic development. Of these he recognizes five as of primary importance: the "monerula," or the first stage of metazoan development; the second stage, representing the egg as commonly understood, which he calls the "cytula;" the third, the "morula," or mulberry stage; the fourth, the "planæa" (formerly known as "planula," though very different stages were often spoken of under that name); and the fifth, the "gastrula."

This paper is accompanied by two plates of diagrammatic sketches copied from various authors, representing the segmentation and gastrula of various invertebrates and vertebrates. Haeckel gives in addition original figures of the same stages in a crustacean, an annelid, a mollusk, and a bony fish. It is a great pity that such a skillful draughtsman should give such untrustworthy figures to illustrate so fundamental a theory, and quietly fall back upon the righteousness of his cause. His figure of a fish embryo has no value as a copy of nature; it is a diagram simply. Such an embryo may exist, but the distrust naturally felt of such fictitious illustrations, by all who are familiar with a portion of his subject, naturally extends in the first place to all his figures and lastly to his whole theory.

The plate devoted to the segmentation of the bony fish is particularly important, as it gives us a totally different interpretation of the formation of the embryo from the one usually accepted. Haeckel's observations were made on the pelagic eggs of what he calls a Gadoid. Judging from closely allied eggs we have had the opportunity to study on our coast, we should say they were more probably Cottoid eggs.

It may not be out of place to call attention to the great abundance of pelagic fish eggs readily obtained, in all stages of development, during the breeding season of a number of our common marine fishes. With the exception of the very earliest stages of segmentation, only to be obtained, owing to the rapidity of the process, by means of artificial fecundation, I know of no method so readily accessible for studying the embryology of fishes as that of collecting pelagic fish eggs. I have myself studied more or less completely the embryology of our sea-perch, tautog, two species of sculpins, two species of flounders, a Motella (young Phycis ?), our blue-fish, menhaden, butter-fish, goose-fish, and several other species of uncertain origin. These pelagic eggs are by no means as delicate as eggs usually laid on the ground and obtained by ordinary artificial fecundation, and the young embryos can generally after hatching be retained alive for a considerable period.

## THE SUMMER BIRDS OF THE WHITE MOUNTAIN REGION.

BY H. D. MINOT.

AS in this article I mean to speak of the birds found in summer in the region of the White Mountains, I may state that my information in regard to them has been drawn from observations made at Conway and Bethlehem. At North Conway, where I spent several weeks in the year 1872, I observed, through whatever part of the neighboring country I went, an almost entire absence of birds. That township, owing to its situation in a valley to the south of the White Mountains, and other causes perhaps, contained, to my knowledge, few birds beside the ruffed grouse, a few ducks in the rivers, sandpipers, one pair of hawks, one pair of kingfishers, a few robins, and the proverbial village swallows. But Bethlehem, the highest village of New England, sixteen hundred feet above the level of the sea, blessed with a cool, invigorating climate, situated to the westward of Mount Washington,

yet practically among the hills, in many places covered with large tracts of genuine old New Hampshire forests, and overrun with brooks, contains thousands of birds in summer, and these birds belong partly to the Canadian fauna. Therefore this article has been written partly to illustrate the distribution of that fauna, but partly, however, for other purposes. When I first came to Bethlehem, two years ago, I found but one pair of robins in the township, but I am glad to see that there are now several pairs, one of which, I have been told, built their nest a little while ago on the top of a long pole, which stood without support in an open hen-yard. Several robins have retired from the village and built their nests in the woods and haunts which seem more appropriate to the other thrushes, of which the Swainson's thrushes are by far the most common, and correspond to the familiar wood thrushes of Massachusetts. The olive-backed thrush sings very sweetly, very much like the wood thrush, but not so finely nor quite so exquisitely; picks up insects of various kinds, as food, among the branches of the trees in the thick woods, particularly woods drained by swamps or streams, and builds its nest in young spruces, from six to ten feet above the ground, laying in these three or four eggs, which are much like those of the scarlet tanager. As with many other birds, it often rears, when undisturbed, two broods of young in the course of the summer. Hermit and Wilson's thrushes are not at all common, and I have met with but a very few in Bethlehem, especially of the former. I do not think that I have ever seen any brown thrushes.

I have seen one or two cat-birds, but these latter, as is the case with the blue-birds familiar to me at home, are to be ranked among strangers in this place. I have been greatly pleased to meet a pair of golden-crowned wrens here, which inhabit a large tract of white birches (the home of chickadees). I found them with a family of young in August, last year, as well as without young in July, this year, though I have not yet been able to find their nest. Chickadees, brown creepers, and both kinds of nuthatches are summer residents, as house wrens also are occasionally. But the winter wrens are of more interest to me than these latter, and I have found a great many in the valleys here, though I inferred from a remark of Dr. Brewer's, before coming to Bethlehem, that they inhabited only the sides of Mount Washington, and like altitudes. These birds are ever busy about the fallen trees and brushwood of the forests, and from the top of some dead limb often pour out a shrill, hurried song of wonder-

ful power and great liveliness. The woods frequented by these wrens, as well as many other forests, abound with warblers, only a few of which regularly pass the summer in Massachusetts, whereas most of them can no doubt in summer be found in Canada. The black and white creepers are not common; but the little blue yellow-backed warblers are quite common, usually busily engaged among the tree-tops, their habits and their song being the same during their migrations through the neighborhood of Boston in the spring. They build their nests chiefly in the drier woods of maples, chestnuts, hemlocks (and oaks), as they do in Massachusetts, when they occasionally pass the summer there. In such woods, and the damper spruce swamps, I often see the black-throated green, or hear his familiar notes, which are sometimes blended with the less musical "*zwee-zwee zwee-zwee*" of the black-throated blue, which refrain is repeated in a peculiar tone, with a rising inflection. The two kinds of warblers, however, which I have been most surprised to meet here are the yellow-rumps and the prairie warblers. I saw a pair of the former among some spruces, my attention having been called to their song, which, by the way, I have heard again and again in the spring migrations of these birds, and which resembles more or less a weak imitation of the purple finch's song. The prairie warblers I have twice met in different woods, and I found in a low spruce, in a dark wood, one of their nests, which, as well as the eggs in it, differed very much from all other specimens in my cabinet. I was rather amazed to find the former species so far to the south of what I supposed to be their range in summer, and the latter species in dark forests, a hundred miles northward of certain sunny pasture-lands in Massachusetts which have usually been considered the northern limit of their distribution.

The Blackburnian warblers are also summer residents here; and though the brilliant coloration of the male is an ornament to the place in which he lives, yet his simple notes, "*wee-seé-wee-seé-wee-seé*" (to which a terminal "*wee-seé-ick*" is occasionally added), are hardly an addition to the various musical charms of the place. I now and then meet black and yellow warblers in the woods, and hear or see chestnut-sided and Nashville warblers in more open lands; but these latter are rare. "Black-polls" belong, I think, to Northern Maine rather than to Northern New Hampshire, and I have met but two here, though I have found several old nests in spruces and hemlocks, which I have attributed to these birds. The Canada fly-catchers, on the

contrary, quite commonly inhabit the cooler woods, where I have often watched the male catching insects and caterpillars with great dexterity, sometimes collecting a dozen or more in his bill, doubtless to feed his mate or young with. The Maryland yellow-throat, however, is by far the most common warbler at Bethlehem, frequenting woods and roadsides alike, never shy but always watchful; whilst the equally familiar "red starts" are also tolerably common, and I often hear them singing in company with others of their family in the depths of the forests. Though I have seen no water thrushes here, yet in the deep woods, since there are no dry groves near the houses, I occasionally hear the familiar chatter of the wagtail (*S. aurocapillus*), generally near some water-course, however, rather than in dry woods.

Whenever I return from a long walk through the haunts of these various warblers which I have just enumerated, I invariably see many cedar-birds on the roadsides and in the orchards, and when I get to the village I can always see there about me all the swallows, including the so-called chimney swallows (which cannot, however, by modern classification claim any near relationship to the true *Hirundinidæ*). Of these swallows the sand martins have established themselves at a sandbank near the central cluster of houses, and have become fairly colonized; whereas the cliff swallows and purple martins (the latter of which a friend reports having seen) have but just made their appearance in the township (for the first time, so far as I know, though perhaps one or two pairs may have spent the last season here, unnoticed by me). About the village both red-eyed and warbling vireos pass the summer (of the latter only one pair); and in the woods I often hear the cheerful warble of the red-eyed and solitary vireo, the latter of which is very rare, whereas the former is quite as common as about Boston, and constantly reminds me of a more familiar neighborhood. Grateful for the society of these vireos, I am thankful that this place is not pestered with their cruel and destructive relatives, the murderous shrikes, of which I have seen no bloody traces as yet.

The finches are well represented at Bethlehem, both by species familiar to us near Boston in summer, and by others. Perhaps the most common representatives are the goldfinches, which frequent pastures, roadsides, and gardens, sometimes, by the way, not laying their eggs until the second or third week of August, since in Massachusetts they habitually build their nest very late in the season, and here all bird sgenerally breed two, three, or four

weeks later than they do two degrees further south (within thirty miles of the shore). The purple finches are rare; but five kinds of sparrows are common, and make up this deficiency; of these the song sparrows, bay-winged buntings, and savannah sparrows frequent the fields, from which I constantly hear their songs — the more familiar music of the two former, and the quaint, drawling "*chip-chirr*" or "*chip-chip-chee-chee-chirr*" of the savannah sparrows. "Chippers" are quite common in the village, and all day long the clear, exquisite whistle of the Peabody-birds (or white-throated sparrows) is heard from the woodland which they inhabit. The snow-birds frequent the woods and hill-sides in many places, and there gain a livelihood by finding food on the ground or about fallen logs and standing stumps, over which they are constantly running; and the indigo-birds are common in pasture-land, whence I often hear their familiar song, sometimes joined with that of the chestnut-sided warbler, or some other denizen of their haunts.

The *Icteridæ* and *Corvidæ* are represented each by two species, the former by the bobolinks and a stray pair of golden robins, the latter by crows (in no great abundance) and a very few blue jays, whose screams I hear but occasionally from the woods. (Thus the number of oscine birds which I remember to have seen at Bethlehem is fifty, of which sixteen are not regular summer-residents in Massachusetts. The number of *Clamatores* is six, and the total number of *Passeres* fifty-six, of which forty are also regular summer residents in the neighborhood of Boston.) The representatives of the *Clamatores* are the following fly-catchers: the kingbirds, the great crested fly-catchers, the pewees, which are not at all abundant, the olive-sided fly-catchers, the wood pewees, and the Traill's fly-catchers, which inhabit much the same places as do the wood pewees, preferring, however, rather drier woods, where, from the upper branches, on which they have taken their post, they utter their characteristic "*pu-ee.*"

Belted kingfishers live near the streams and mill-ponds; and in the forests which border upon these, live the humming-birds, which rarely come to the gardens in the village, preferring the woods to open grounds, as I believe that they often do in more cultivated and more thickly populated districts. Occasionally, whip-poor-wills enliven the night with their cries, and night-hawks very often fly about at dusk, sometimes in company with the few chimney swallows which live in the village. I have once or twice heard the notes of the (yellow-billed?) cuckoo from the shrubbery

which borders upon the woods, where live the hairy woodpeckers, — whose relations, the downy woodpeckers, I do not remember to have often seen here, — and also the three-toed woodpeckers (*Picus arcticus*), of which I have seen but one pair; the yellow-bellied woodpeckers, regarding which I may make the same remark; the great log-cocks (*H. pileatus*), which particularly affect old forests and backwoods; and the common flickers (*Colaptes auratus*). (These birds are the seventeen representatives of the Picarian group, and five of these do not regularly breed in Massachusetts.) I have seen no birds of prey, except occasionally four hawks: red-tail, sparrow-hawk, sharp-shinned hawk, and marsh hawk; a golden eagle; and as to the game-birds, there are wild pigeons, ruffed grouse, one pair of woodcock, no snipe, but a few ignominious sandpipers (*T. macularius*; also *R. solitarius?*) in their stead. With these five latter birds and one accidental heron (once seen flying over the valley) I close this perhaps imperfect list of the eighty-three birds which are summer residents at Bethlehem, twenty-one of which are not summer residents in Massachusetts, unless irregularly so. Many of these birds represent a Canadian fauna; some belong to that and the Alleghanian fauna too, whereas a few belong entirely to the latter. These facts show that Bethlehem is situated on the line between these two faunæ, and contains an interesting admixture of birds which belong to different areas of distribution.

## THE HISTORY OF THE ORIGIN AND DEVELOPMENT OF MUSEUMS.

BY DR. H. A. HAGEN.

COLLECTIONS of objects of natural history are indispensable nowadays to the naturalist in his studies. The advantage of such collections to the student is indeed very obvious, as the study of natural history consists chiefly in comparison. Every description, every observation, is more or less a comparative one, even if the object compared is not mentioned; and it is easily understood that richer and more complete collections help to a more complete study, a more perfect work. The history of the origin and development of collections of natural history is not devoid of interest, perhaps even profitable for science and for the important question as to which would be the most convenient arrangement of a collection. The materials for such a history are scanty, for those

of ancient times are nearly wanting. But the impossibility of believing that knowledge in natural history would be attained and furthered without collections induced Professor Beckmann to express the opinion in a short but interesting paper on this subject, some ninety years ago, that the origin of such collections was to be found in the old custom of keeping curious and remarkable objects in temples. This opinion gains some ground, as the medical sciences are considered to have originated in the written reports of convalescents about their sickness, and the remedies used, which were posted in the temple of Æsculapius for everybody's instruction. There are some interesting facts quoted by the classic authors. The skins of the hairy men from the Gorgades Islands, brought home by Hanno's expedition, were still preserved in the temple of Juno, three hundred years after Carthage was destroyed. The late Professor J. Wyman ingeniously suggested that they might be the skins of the gorilla. The horns of the Scythic bulls, exceedingly rare, and alone capable of preserving the water of the Styx, were given by Alexander the Great to the temple of Delphi. The horns of the renowned obnoxious steer from Macedon were presented by King Philip to the temple of Hercules; the abnormal omoplate of Pelops was in the temple at Elis; the horns of the so-called Indian ants, in the temple of Hercules at Erythris; the crocodile brought home by the expedition to the sources of the Nile, in the temple of Isis at Cæsarea. A large number of similar cases are quoted in Professor Beckman's above-mentioned paper. The choice of places devoted to religious service, for such deposits, was very appropriate, every spoliation of them being considered sacrilege. So it happened that such curiosities were preserved many centuries, and the not infrequent additions in such a space of time formed at last a somewhat considerable collection, open at any time and to everybody. The variety of prominent objects was certainly instructive to the observers.

Apollonius saw with wonder in India the trees bearing the different kinds of nuts he had seen before preserved in the temples in Greece. After all, things brought together in such confusion were the origin of collections; and in fact this custom was continued through the Middle Ages, changed only by the exclusion of objects not agreeing with the sanctity of the place. In a votive temple on the battle-field of Feuchtwangen hung the omoplate said to be that of the commander of the Teutonic Order who had fallen in battle four hundred years ago; it is now

in the museum in Koenigsberg, Prussia, and belongs to a whale. Even now this custom is not entirely obsolete.

It seems certain that prominent naturalists, such as Aristotle and Apuleius, must have had collections, though there is no direct testimony to that effect given in any of their works still extant. The order of Alexander the Great for hunters, trappers, and fishermen to bring all kinds of natural objects to Aristotle, is well known; Theophrast and Apuleius are also known to have studied and dissected many different kinds of animals, chiefly fishes. Apuleius is the first naturalist known to have found it profitable and necessary to make voyages for the purpose of studying foreign animals, and collecting palæontological objects in the Getulic Alps, but unfortunately all his works on zoölogy are lost. The Emperor Augustus is considered the first prince possessing collections of a scientific nature.

I presume that the certain knowledge of the collections of the great naturalists above quoted was lost, as the collections themselves were quickly destroyed, for lack of means for sufficient preservation. The truth of this explanation is made more apparent since the successive discovery of more convenient and easier means of preservation of objects has made these collections more lasting and permanent through later generations. In a really interesting and obvious way, every new discovery, every improvement in the manner of preservation, has given a newer and stronger impulse to the enlargement of the collections, to the perfection of science.

Some methods of preserving objects were of course known to the ancients, but these methods were the same as those used for the preservation of food or of corpses, and generally not at all adapted or sufficient to preserve objects in a manner to make them fit for scientific purposes. The principal of these methods consisted in the exclusion or the prevention of the obnoxious action of oxygen. So the objects were preserved or dried, pickled with salt or spices, or entirely covered with salt water, honey, or wax.

The sow which was said to have borne thirty young pigs to Æneas was pickled by the priests, and was still to be seen at Lavinium in Varro's time, some ten centuries later. Large African animals pickled with salt, two hippocentauri and a large monkey, sent to Rome, were seen many years later by Pliny. Other large animals preserved in the same way were sent to the emperors in Constantinople, and even much later the hippopotamus described by Cohunna arrived, pickled with salt.

It was the custom among the Assyrian people to preserve corpses in honey, and this did very well also for delicate objects. When Alexander the Great conquered Suza, he found a very large and expensive quantity of purple dye two hundred years old, preserved in an excellent condition by an external layer of honey. Covering the objects with wax preserved them well, but for scientific purposes not better than the mummies of animals found to this day in the Egyptian pyramids. The celebrated book of Numa Pompilius, found in his grave, was entirely covered with wax, and, though five hundred years old, in perfect condition.

The long space of time after Christ's death, nearly twelve centuries, is entirely devoid of interest concerning natural history. Curious enough, and perhaps explaining this lack of interest, is the fact that in the earlier centuries of the Christian era the study of natural history was believed to be in some way a proof of religious infidelity. The reason of this will probably be found in the lack of education and study of the disciples and nearly all the apostles. Discussion would have been impossible, difficult, or of doubtful result. Simple faith covered all. So it happened that the prominent works of Aristotle were nearly lost in Europe. Translations of these into the Arabian language, introduced in the tenth century through Spain, and again translated into Latin, were used, and the original text was perhaps not known until the fifteenth century in the west of Europe. Except a few scanty pages in the works of Saint Isidorus, there was nothing written about natural history before the time of Albert the Great, and of course no collections existed. We are told by Begin, in his work on the natural history of the Middle Ages, that rich abbeys and cloisters possessed indeed some collections of medicinal or poisonous plants, of fossils, minerals, and shells. Even in the time of the Crusaders, such collections were augmented by frequent voyages in foreign countries. Some of these curiosities are still preserved: for instance, in the treasury of St. Denis, in France, the feet of a griffin, sent to Charles the Great by the Persian Shah; some teeth of the hippopotamus, and similar objects.

The vast erudition of the celebrated Albertus Magnus, a Catholic priest born in Bollstadt, in Germany, extended even to natural history. His works are in every way admirable. The manifold voyages of this savant, his long residence in very different places, Cologne, Paris, Rome, and Regensburg, facilitated the observation of different animals. The works of Aristotle

were known to him only in the Arabian translation, and he apparently possessed no collection; at least, in going through his works, it is evident that the animals were described after living or fresh specimens.

Science, during the next three centuries, did not advance in a remarkable way; we find nothing but repetition of the statements of Albertus and his disciples, Cantipratanus, Bartholomæus Anglicus, Roger Bacon, Vincentius from Beauvais, and others.

The middle of the fifteenth century, and the time immediately following, is one of the most striking periods in history. The invention of printing, the discovery of America and of the way around Africa to the East Indies, the overwhelming amount of gold and silver gained by trade or war in those new countries and suddenly inundating all Europe, followed by the momentous times of the Reformation, made a change in fashion, in study, and in knowledge, never seen before, and perhaps never to be seen again. Art and science advanced in the same rapid manner, the latter prepared in some way by the large immigration of learned Greeks, after the destruction of the Greek empire by the Ottomans.

The same great time produced some discoveries of the highest importance to the existence and preservation of collections; the most important, now considered by millions as the greatest calamity, being that of alcohol. This fluid was known to alchymists long before, but the use of it as medicine, as drink, and for the preservation of animal substance, certainly not much before 1483. A poem printed in that year, in Augsburg, set forth the excellent qualities of the fluid, and stated decidedly that it had been proved that all meat, fish, and fowl put up in alcohol would be well preserved, and would never decay. But ten years later we find the same use and abuse of alcohol as at the present time. The use of alcohol for the preservation of objects offered the additional advantage of their being easily seen and studied. Something else was needed, however, namely, good transparent glass jars or bottles, and the means of closing them as well as possible. I have not been able to ascertain the time of the first manufacture of transparent glass bottles; I suspect, however, that it may belong to some earlier time. The use of cork to close bottles dates surely after the middle of the sixteenth century, as in 1550, at least in France, it was known to be used only for soles. Before this time, and even a century later, wax or resinous stoppers were used.

Paper, a very important object for collections, has been known since the beginning of culture in the East, but the use of it became gradually less and less, on account of heavy taxes upon it, from the beginning of the Christian era to the sixth century, and in the twelfth and thirteenth centuries the use of it was nearly forgotten. Cotton paper was carried by Arabs to North Africa in the tenth century, and two centuries later to Spain. Curiously enough the manufacture of linen paper was discovered through an intentional fraud. People first tried to make cheaper cotton paper by the introduction of linen rags, and very soon observed that the paper was greatly improved by this addition. Of course the manufacture with linen rags alone gave a more perfect paper, and was retained. This was probably first manufactured in Germany, as there exist old deeds in Bavaria on linen paper from the year 1318. Paper mills existed in 1341 in France, and later in Nurnberg, Holland, Basle, and Switzerland. Some mills existed in England, but produced only packing-paper; till 1690 all writing and printing paper was imported from Holland. It is sure that at the end of the fifteenth century linen paper was everywhere used, and cheap enough to displace the costly parchment. It is obvious that the common use of paper was a great advantage to every student. Botanical collections were only possible when the preservation of dried plants could be afforded. Just at this time the name herbarium, with its present meaning, seems to have originated.

Before this time, objects of natural history accompanied only by chance the more valuable objects of trade. Now science seemed suddenly to be awakened, or rather new-born. Every one was in haste to study the new objects, never seen before, and arriving in great numbers from newly-discovered countries. It was a natural consequence that those of the old country should be compared with the new ones, and every student was surprised to find so much around him that he had never known before.

Conrad Gesner, a naturalist from Switzerland, a student of vast erudition and clear judgment, may be considered the renovator of natural science. History begins a new volume with his name, and his works are for the next centuries of the same importance as those of Albertus Magnus for earlier times. Gesner began in a right and sensible way to study thoroughly the common objects nearest him, and by this means was enabled to understand more easily those from foreign lands with different features.

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Switzerland, Genoa, Venice, Augsburg, Nurnberg, were at this time in a most favorable position for students. The largest trade of the world, from the East Indies, passing through these cities made them the most important centres of trade. The celebrated house of the Fuggers, in Augsburg, possessed the whole north of South America, a country larger than Europe; and it was therefore easy for them to collect in their princely mansions the wealth and curiosities of the world.

The desire to possess the largest collections increased in a way easily to be understood, especially as the invention of the printing-press had now afforded facilities for making the facts known to the world in a very short space of time. As the trade was in the hands of merchants, of course the collections were in their hands also, or in those of private students more or less widely known, as, for instance, Agrippa, Monardus, Paracelsus, Valerius Cordus, Hieronymus Cardanus, Matthiolus, Conrad Gesner, Agricola, Belon, Rondelet, Aldrovand, Thurneisser, Ortelius, from Italy, France, Switzerland, and Germany. England, too, was not behindhand, and Hackluyt gives an index of private collections in that country. The arrangement and contents of these collections are given in printed lists, the first known of which is that by Samuel Quickelberg, a learned physician of Amsterdam, published in 1565, in Munich. Shortly after, Conrad Gesner published the catalogue of the collection of Johann Kenntmann, a prominent physician in Torgau, Saxony. The whole collection contained in a cabinet with thirteen drawers, each with two partitions, about sixteen hundred objects: minerals, shells, and marine animals; and yet it was thought to be so rich that students made long journeys to see it, and Kenntmann stated that the objects were collected at such an expense as few persons would be able or willing to afford. Similar catalogues are published by Mercati, from Rome, Imperati, from Naples, Palissy, from Paris, and Thurneisser, from Berlin.

I cannot omit here to mention that nearly all interest shown in science was manifested by Protestants, the few honorable exceptions being mostly priests, who understood the times, and the necessity of being always among the foremost, in order not to lose their ascendency. The followers of Loyola were, soon after the institution of the order, eager enough to gain distinction even here. Following the history of our subject, our attention is called to the very striking fact that all departments of science before the Reformation fell gradually into the power of the predominant

church, which hurled an anathema against all further investigations. The noble and brave inhabitants of Spain, the valiant and intelligent people of Italy, the nervous and quick-minded French, the accurate and slow Germans, all were in the same way subdued, and prepared to recognize nothing but the ideas approved by the church. Curiously enough, there never existed a stricter censorship of published books, the censors being at first Catholic priests and afterwards principally Jesuits, and their opinions are printed on the first page of many old works on natural history. It should never be forgotten that while those countries which accepted the Reformation grew stronger and stronger, fostered intelligence, and furthered science, all others, even the noblest, degenerated, and never again reached their former prominence, though they struggled bravely and nobly. Everybody will remember poor Galilei, a giant sacrificed to the glory of the church. Every kind of free thought seemed then, as at the present time, most pernicious to this infallible institution.

It now became the fashion for princes to possess collections. They contained celebrated medicines paid for by their weight in gold. Bezoar, the horn of the unicorn, the Maledivian nut, the Alraun, were perhaps placed side by side with such rarities as the pistol with which Berthold Schwarz tested gunpowder when he had discovered it, with Chinese or Egyptian relics, and what would now be considered bric-à-brac of every kind. The German Emperor Rudolf II., otherwise known for his avaricious and indecent behavior, spent large sums of money for his collections, and paid a thousand gold florins, a very large sum for those times, to his artist Hoefnagel, for drawing the specimens contained in them. The magnificent miniatures on parchment, in four volumes, are still extant. The Princes of Gottorf brought together an admirable collection, called, after the fashion of those times, Kunstkammer (cabinet of art), the remnants of which are still prominent treasures of the collections of Copenhagen and St. Petersburg.

A competition now arose between travelers in search of interesting objects. I will mention only those of the Baron von Herberstein to Moscow, of the Ambassador Busbeq to Constantinople, who imported the first tulip, of Olearius to the East Indies, and of Kaempfer to Japan. Eventually nearly every prince felt obliged to have a well-arranged cabinet.

A prominent physician in Nurnberg, Besler, published a description of his collection, or rather figures of some objects, in 1642; the first edition of which is very rare, printed on blue-tinted

paper. The collection contains dried plants, Indian nuts arranged on a string (a horrid poison), a branch of a plum-tree with one hundred and twenty plums, weighing thirteen and one quarter pounds, horns of the unicorn, monstrous horns of other animals, a stuffed lynx, whose open mouth and red tongue made him look very ferocious, the cranium of a wolf, the bone of his tongue and wind-pipe, a rodent animal from Moscow, some birds, the cranium of a swan, a nautilus with carved shell, monstrous heads formed by shells, minerals, money, medals, crystals, the sword of Ziska, a Turkish pipe, vases of terra sigillata, fire-proof cloth of asbestos, jewels, guns, old stone hatchets, corals, Indian ink, fucus growing on a stone, and petrefactions.

I have enumerated purposely the contents of one collection of this time, and have chosen this particularly because it seemed to be the most interesting, as the description of it was reprinted four times in the years immediately following. A rich and partially classified catalogue of John Tradescant's collections was published in England by his son; but one will not be surprised to find such a heading: "Some kinds of birds and their eggs," and among them "Easter-eggs of the Patriarch of Jerusalem," and "the claw of the roc bird, which, as authors report, is able to truss an elephant."

As numerous other collections of this period were arranged in a similar manner, I prefer to mention only one more, that of the Jesuits in the Collegium Romanum at Rome, because the catalogue printed in 1678 shows the interior rooms in which the collection was arranged. As Italy was at this time still the leading country of the world in fashion and culture, and the order of the Jesuits influential and powerful, the arrangement of their collection may be considered as a fair example for others in that century, which certainly more or less imitated it, but never surpassed it. We find large, vaulted galleries, connected with vaulted rooms, the floor covered with inlaid marbles, the ceiling with allegorical pictures. The arrangement of the exhibited objects shows a kind of refined taste, and is agreeable to the eye; the taller and more prominent objects being arranged by themselves in the middle, as, for instance, a number of Egyptian obelisks, on the top of each of which were placed emblems of Christianity. Busts and other objects were placed on columns along the wall, the spaces between them being provided with shelves bearing smaller objects. Pictures and astronomical maps fill the upper part of the wall, and heavier things, such as a crocodile, are suspended from the ceil-

ing. Not the least prominent object of the museum is an obelisk, made in the Egyptian fashion, to celebrate the memory of the conversion of the Swedish Queen Christina, the daughter of the most prominent king in the Thirty Years' War, Gustavus Adolphus, the fact of the conversion being expressed on the obelisk in thirty-three different languages.

Just at this time a curious historical essay on the origin and development of museums, and the best arrangement of them, was published, the author of which was probably a certain Major, and this very rare pamphlet, first published in 1674, has been reprinted later in Valentyn's Museum Museorum. According to the fashion of the time the author begins with the enumeration of the different names for such exhibitions, and out of forty of these, seventeen are Greek. I think it would be rather hard to remember them all, and even tedious to hear them repeated. The number of collections from the time of King Solomon to the author's time is computed to be one hundred and forty, twenty-two of which belonged to prominent princes; many of them are spoken of more in detail, but mixed with fabulous stories. The author believes it very probable that King Solomon possessed a collection, and is sure about King Hizkiah of Jerusalem, and Ptolomæus Philadelphus of Alexandria. He speaks about the museum of the Greek emperor in Constantinople, said to have contained the whole poetry of Homer written on the skin of a dragon, a fact which he concludes to be somewhat doubtful, as according to his calculation this skin must have been one hundred and twenty yards long.

At some length are given details about the collections of the Great Mogul in Agra, of the Inca in Peru, and of Montezuma in Mexico, the last two being real marvels of richness and value. All the animals, trees, and plants of the country were manufactured in pure gold or silver, in life size, and smaller ones in jewels, and placed in the gardens of the court. Montezuma is said to have possessed a zoölogical garden with all the living animals of the country, the ditches for marine animals being filled with salt water. Most of the facts given in this essay are partly exaggerated, partly erroneous; nevertheless some of the chapters, suggesting the best rules for arranging a museum, are quite interesting.

(To be concluded.)

## CALIFORNIAN GARDEN BIRDS.

BY J. G. COOPER, M. D.

THE sociable and confiding disposition of the birds of the western United States as compared with the same species eastward has been noticed by several late writers, but the reasons have so far been scarcely mentioned. Among them perhaps the strongest is that bird-collectors and idle boys are less numerous, while sportsmen find larger game so plenty that they do not waste ammunition on birds so small that no one but a foreigner would take the trouble to pick them for the table.

Besides this, the prevalence of prairies over most of the western regions makes any garden full of trees and shrubs a rare nursery for the woodland species, where they find more protection from hawks and weasels than in their native groves, while they may also levy a small contribution on the fruits in return for the insects they destroy, and their lively songs. In California the poison intended for ground-squirrels has also destroyed millions of birds about the fields, and left them unhurt in gardens.

It is interesting to notice that most of the early travelers in California mention the comparative scarcity and silence of small birds about the first settlements.

In the garden at Haywood, eighteen miles southeast of San Francisco, in which I have before noted the nesting of the Anna humming-birds, so great a variety have built this spring that some notes on the others may be of general interest. The extent of ground is only half an acre around the house in which I live, and most of the nests mentioned are within it. The humming-bird referred to (*Calypte Anna*) is the only species that has built here, though swarms of the Nootka hummer frequented the eucalyptus-trees during April, on their way north. Another nest was built, and the eggs, laid April 23d and 24th, hatched May 11th, thus confirming the remarkably long (from seventeen to eighteen days) period of incubation.

A single *Stellula calliope* was shot April 16th near here. I saw one *Trochilus Alexandri* May 4th, and one *Calypte costæ* May 16th; but these hummers are very rare near San Francisco. An Arkansas kingbird (*Tyrannus verticalis*) has a nest in a tree in the street adjoining the garden, but too high to examine. A black pewee (*Sayornis nigricans*) had built under the eaves of an adjoining barn as early as February, but also too high for close observation. A pair of western bluebirds (*Sialia Mexicana*) had

raised a brood of young under the roof of the adjoining house, and all of them have frequented the garden much after May 4th. The well-known summer yellow-bird (*Dendræca æstiva*) arrived April 20th, and a pair have a nest in the garden, though its site has not yet been discovered.

The barn swallow (*Hirundo horreorum*) builds, as elsewhere, in the barns, against rafters, etc., arriving March 19th. The cliff swallow (*Hirundo lunifrons*) builds under eaves of barns and houses much more abundantly than the last. I saw two instances in town where bluebirds took possession of nests of this bird about the 15th of March, and successfully held them against the owners, which returned from the south on the 24th. A pair of white-bellied swallows (*Hirundo bicolor* var. *vespertina* Cooper) took possession of a little bird-house which I put upon a post twelve feet high, near the house, and have built and laid eggs in it since April 30th. (Some others were building in town after their arrival three months earlier.) They had to drive off a saucy wren which had a nest near by, but had tried to hold two houses by building a sham nest in this one, and often endeavored to tear down the swallows' nest in their absence.

This western variety of the *H. bicolor* is larger and bluer than the eastern, though so far without a distinctive name. I found it breeding in 1873 as far south as latitude 35°, in Ventura County, Cal., near the coast. A house wren (*Troglodytes ædon* var. *Parkmanni*), as just remarked, built in a bird-house placed on the end of the porch. This species arrived March 30th, though a few winter within a hundred miles southward. The male of the pair mentioned came to the garden about the 10th of April, and very industriously worked at building a nest for two weeks before it persuaded a female bird to remain. It sung constantly, but less finely than the eastern birds, from which its longer tail, never held vertically, further distinguishes it.

Two pairs of the house linnet (*Carpodacus frontalis* var. *rhodocolpus*) have nests in a Monterey pine (*P. insignis*), another in a cypress, one under a plank placed in the forks of two trees for a swing to hang on, and one pair in a rose-bush covering the end of the porch, where children can look freely into it. This last had the first egg laid April 22d; incubation began on the 25th, and the young hatched May 6th and 7th, requiring about eleven days. Although thousands are shot in the fruit season on account of their destructiveness, neither the numbers nor the familiarity of this characteristic western bird seem to be dimin-

ished. They swarm also in the groves and kill vast numbers of the yet more destructive caterpillars during the spring months, being thus quite as useful as the imported English sparrows.

The Arkansas goldfinch (*Chrysomitris psaltria*), commonly called here "wild canary," abounds in gardens. A pair built in a rose-bush close to the path, and not over three feet from the ground, commencing to set on four eggs April 20th and hatching in ten days. They only raised one young, which left the nest May 16th. Others were fledged when this hatched, and still other pairs were just laying, in nests usually from six to twenty feet up in fruit-trees, one however in a pine. The eggs here are pale greenish or almost white, and 0.45 by 0.60 inch. The Lawrence's goldfinch (*Chrysomitris Lawrencii*), not yet distinguished by any popular name, is also abundant in oak groves, and has varied its habits so far as to begin to frequent gardens where coniferous trees grow, building in pines and cypresses, as the nearest approach in density of shade to the favorite live-oaks, though I have never seen these birds at Monterey, where the former trees are native. Dr. Brewer was evidently led into error by Dr. Canfield's identification of their eggs from Monterey, as given in North American Birds, i. 479, where he says they are "exactly similar to those of *C. psaltria*," etc. Those I got near San Diego in 1862 were, as described in the Ornithology of California, i. 171, "*pure white*, measuring 0.46 by 0.60 inch" (misprinted 0.80), and many found here are merely a little larger, 0.48 by 0.65 inch. A pair of chipping sparrows (*Spizella socialis*) built in a cypress about eight feet above the ground, and others have nests about the garden. They arrived March 31st, and the first egg seen was on May 14th. The gayest of the small summer visitors is the blue linnet (*Cyanospiza amœna*). It arrived April 20th and built a nest in the garden. A nest found in a thicket May 15th contained four nearly fresh eggs, like those described in the Ornithology of California. The brown finch (*Pipilo fuscus* var. *crissalis*), though often called "cañon finch," is not more common in secluded valleys than in gardens where protected; and, being a constant resident, becomes one of the tamest of native species, coming to the door for food and building as near the house as it can find a location. Like other resident birds it shows much variation in time of nesting, as it laid the first egg here as early as April 1st, in a pine-tree, twenty-five feet from the ground, and I suspect some were even fledged by that time, as was said to have occurred in a neighboring garden.

The western oriole (*Icterus Bullockii*) arrived here March 31st. My statement in the Ornithology of California that they arrive at San Diego as early as March 1st applies only to a very few *avant-courriers*, as most of them reach there after the 15th. They reached Ventura County in 1873 about the 20th; but as I saw one in the November previous, a few may winter in California, that being two months later than they usually leave.

A pair built in a hanging branch of a gum-tree (*Eucalyptus*) in the garden, about thirty-five feet from the ground. The male was in the immature plumage (like the female), and another male skinned by me April 24th was similar, so that, like *Icterus spurius*, some of the males, if not all, require more than one year to obtain perfection, a fact not before recorded. Like the *Icterus Baltimore* and the other species as far as known, it probably requires three years, though the stages are not so very different as to have been called *species*, as with *Icterus spurius* and many tropical American forms.

The following birds also built in other gardens in town, but I could not watch them so carefully. The western yellow-bellied fly-catcher (*Empidonax difficilis*) arrived March 30th. One pair built early in May on a beam under a wagon-shed, in the manner of the pewees, but, pertinaciously retaining their woodland habits, tried to conceal the nest by a wall of green moss partly hanging over the edge of the beam and making it still more conspicuous by the contrast of color. Three other nests found along the neighboring creeks were built on slight projections among roots and stumps overhanging the water, from four to twenty feet above it, and all with the same green mossy parapets. I have identified the birds by shooting several. The differences in both young and adult birds between this and the eastern *E. flaviventris* pointed out in the North American Birds, iii. 363, as well as the entire difference in nesting and eggs described on page 380, with which mine agree perfectly, seem to require a specific separation of the western birds, none being found intermediate. In the Ornithology of California, i. 328, I could not distinguish the western adult bird from the incomplete descriptions of the eastern, the young only having then been critically compared.

The *Empidonax pusillus* of Northern California seems, however, to graduate southward into the eastern var. *Traillii* as given by me, though I should have used the prior specific name. The nests and eggs described by me in the Ornithology of California, i. 330, probably belonged to *pusillus*, which I have not seen in this more open region. *E. Hammondii* is a more eastern form.

Swainson's greenlets (*Vireosylvia gilvus* var. *Swainsonii*) arrive about March 30th, and some keep about gardens, where I have found their old nests. None of the characters distinguishing the western and eastern races seem to be invariable, while their songs and habits do not serve to distinguish them specifically. Their arrival at San Diego, April 10, 1862, as published by me, must have been two weeks later than usual.

The western mocking-wren (*Thryothorus Bewickii* var. *spilurus*) is a constant resident, but commonest in winter. A pair built in a small box in a stable, and had young when discovered in April. The open nest in a bush described by me in the Ornithology of California, i. 69, is evidence of an unusual departure from their common habits, and was very probably an old nest built by some other bird, this species generally building in dark cavities of trees, brush-heaps, etc., but now apparently growing more familiar. It shows variations in building similar to *T. Ludovicianus*.

The American goldfinch (*Chrysomitris tristis*) is less common here in summer than the western species, immense numbers going north of this State in April, while the others are not known to occur in Oregon, and most of *C. Lawrencii* go south of this latitude in winter, being then replaced in numbers by this species. On this coast they seem to breed earlier than eastward, as I found several undoubted nests in Ventura County about April 18th, in willows where none of the other species ever appeared. The eggs described by me from Santa Cruz may, however, have been those of *C. Lawrencii*, as they were smaller than usual, perhaps, however, from belonging to a second brood.

I may note here, in connection with this genus of birds, that I killed one of *C. pinus* as late as April 15th, and that they built in the tall pines near Monterey, where I saw them in June, 1874. This most southern locality recorded is accounted for by the cool winds, fogs, and pines of the place.

The California song sparrow (*Melospiza melodia* vars. *Samuelis*, *Heermanni*), like all species of birds which run into many local varieties, is little if at all migratory. Where cats are not too troublesome it becomes the most familiar of birds. The great variations in the size of these birds in California, from which the varieties above named and also *M. Gouldii* have been described (and even placed in other genera), are not confined to any latitude, unless the last (and smallest) was from the peninsula, the middle-sized (*Samuelis*) being found about San Fran-

cisco Bay, though more rare than larger ones. In Ventura County I found them to vary in full from 5.65 to 6.25 long, wing 2.40 to 1.80. The eggs also vary exceedingly in size and pattern between the extremes given in Birds of North America, iii. 25 and 27.

I might extend this catalogue of garden birds considerably by mentioning additional species found building in other places in gardens, but less commonly. The following are common here along creeks on the borders of the town, but not yet found building within garden fences.

The Oregon thrush (*Turdus ustulatus*), now known to build as far south as latitude 35° and probably 34° in California, arrived here April 20th, when *T. nanus* had gone north. I have been informed that the robin (*T. migratorius*), never before known to remain in the valleys in this latitude in summer, has begun to breed in cherry orchards three miles from here.

The black-capped warbler (*Myiodioctes pusillus* var. *pileolatus*) arrived March 30, and in Ventura County March 18, 1873. This is a month earlier than I saw them nearer the coast, as noted in the Ornithology of California, i., and accounts for their early appearance in Oregon. It is a month earlier than the summer yellow-bird, for which I mistook it in 1854 at Puget's Sound, arriving April 10th. (Natural History of Washington Territory, ii. 181. These dates also need correction in later books.)

The bank swallows (*Cotyle serripennis*) have holes in the steep banks of the creek, one of which I opened May 17th, and found seven fresh eggs in it at a depth of two feet, and five feet from the top of the bank. The ground wren (*Chamæa fasciata*) is a resident in bushy places along creeks or on dry hills, and often frequents fences about clearings where shrubs or brush are abundant. It is very artful in concealing its nest in dense thickets. The plain titmouse (*Lophophanes inornatus*) is a very sociable bird where its favorite live-oaks are left standing near houses, building in March in any suitable hole it finds. The least titmouse (*Psaltriparus minimus*) is another sylvan bird which remains about houses among oaks and other trees, even in the city of San Francisco. I obtained a nest with seven fresh eggs on May 15th. The western purple finch (*Carpodacus purpureus* var. *Californicus*), though not before seen in summer in the valleys, sometimes remains near the cool bay of San Francisco, and, if not building in gardens, joins the house linnets in their depredations on fruit.

The black-headed grosbeak (*Hedymeles melanocephalus*), a delightful summer songster often called here "bullfinch," is inclined to be very sociable, though its nests are so often robbed by boys for cage-birds that it builds mostly in places more retired than gardens.

The redwing blackbird (*Agelaius phœniceus*, and var. *gubernator*), though preferring marshes, often builds here in small trees on the borders of boggy streams within cultivated grounds, if unmolested. I saw a fine male this spring with the shoulders entirely orange, the opposite extreme from var. *gubernator*. Brewer's blackbird (*Scolecophagus cyanocephalus*) is numerous about houses, and builds in companies in low trees where unmolested. It has recently taken to roosting in winter in the evergreens of the "Plaza" in the noisiest centre of San Francisco, with English sparrows. The California jay (*Cyanocitta Californica*), if not so much persecuted, would be abundant and very bold around houses where oak-trees grow, but the boys drive them to wilder building-resorts. Its thievish habits and practice of destroying other birds' eggs make it a bad tenant. The size of eggs I gave in the Ornithology of California was misprinted 1.80 by 1.04 instead of 0.80 by 1.04; these San Diego eggs being, as usual, smaller than others from northward.

Gairdner's woodpecker (*Picus pubescens* var. *Gairdneri*) is a common visitor to the gardens, and, like its eastern relative, will doubtless burrow for nests in old fruit-trees. The allied *Picus Nuttallii* seems to avoid this region.

The rufous humming-bird (*Selasphorus rufus*), though very familiar in other places at least as far south as latitude 35°, I have not seen here building near houses, though a few do build along creeks, preferring moist locations. On the other hand, the barn owl (*Strix flammea* var. *pratincola*) is very common, and, where protected for the purpose of destroying vermin, becomes familiar. One pair has a nest in a windmill, and another built in a hole in a steep, high bluff at the edge of a garden, where I got fresh eggs April 10th. The nest and eggs mentioned as from me in North American Birds, iii. 522, prove to belong to the *Geococcyx*.

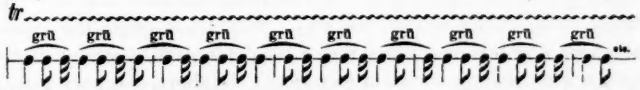
Finally, the California quail (*Lophortyx Californicus*), though becoming rare so near San Francisco, is very tame about houses where it is protected, feeding and laying eggs near the barnyards.

## THE CHIRP OF THE MOLE-CRICKET.

BY SAMUEL H. SCUDDER.

THE common mole-cricket of the United States (*Gryllotalpa borealis* Burm.) usually commences its daily chirp at about four o'clock in the afternoon, but stridulates most actively at about dusk. On a cloudy day, however, it may be heard as early as two or three o'clock; this recognition of the weather is rather remarkable in a burrowing insect, and the more so since it does not appear to come to the surface to stridulate, but remains in its burrow usually an inch below the surface of the ground. The European mole-cricket is said to chirp both within its burrow and at its mouth (*plerumque sub terrâ*, Fischer says), and it may be that our species sometimes seeks the air in chanting; but the chirp, as far as I have heard it, always has a uniformly subdued tone, as if produced in some hidden recess. Fischer says that the European species, which is twice as large as ours, cannot be heard more than from one hundred to one hundred and fifty feet (*ultra spatium* 20–30 *passuum*). Ours, when certainly beneath the surface, is easily distinguished at a distance of five rods; and one would presume that it could be heard, if above ground, nearly twice as far away.

Its chirp is a guttural sort of sound, like *grü* or *grēēu*, repeated in a trill indefinitely, but seldom for more than two or




three minutes, and often for a less time. It is pitched at two octaves above middle C, and the notes are usually repeated at the rate of about one hundred and thirty or one hundred and thirty-five per minute; sometimes, when many are singing, even as rapidly as one hundred and fifty per minute. Often, when it first commences to chirp, it gives a single prolonged trill of more slowly repeated notes, when the composite character of the chirp is much more readily detected; and afterward is quiet for a long while. When most actively chirping, however, the commencement of a strain is less vigorous than its full swell, and the notes are then repeated at the rate of about one hundred and twenty per minute; it speedily gains its normal velocity. The note sounds exceedingly like the distant croak of toads (*Bufo*) at spawning season, but is somewhat feebler. Zetterstedt com-

pares the chirp of the European species to the note of *Hyla arborea*.

Although belonging to the saltatorial Orthoptera, this insect, like the other species of its genus, is a poor leaper; *inepte salit*, says Fischer of its European congener. But on the other hand, it can run backward quite as easily as forward, — a fortunate gift, as the greater part of its burrow is too narrow for it to turn in. — *Psyche*, Cambridge, Mass.

## REPLY TO MR. J. A. ALLEN'S "AVAILABILITY OF CERTAIN BARTRAMIAN NAMES IN ORNITHOLOGY."[1]

BY DR. ELLIOTT COUES, U. S. A.

MY reply to Mr. Allen must not be considered controversial, for two reasons. In the first place, my original article stated the whole case, from my point of view, so carefully, so completely, and so explicitly, that I am left without ground for further argument. Secondly, nothing that Mr. Allen adduces in his critique invalidates the principle I established, most of his criticism being irrelevant to the main point at issue, namely, that if any of Bartram's identifiable, described, and binomially named species were entitled to recognition, then all such of his were equally so entitled. Mr. Allen himself admits this, the whole point and purpose of my article, his protest being simply against the painful necessity of so doing; out of ten Bartramian species which "Dr. Coues proceeds to newly 'set up,'" he acknowledges the rightful claim of "six or seven" to be so dealt with, thereby yielding the very point he wished to refute. In short, the only actual disagreement between Mr. Allen and myself is that he is able to identify satisfactorily rather fewer of Bartram's species than I succeeded in doing. But this last is a matter to which I gently alluded in my article when I said in substance that ornithological experts would of course identify Bartram's species according to their respective ability.

But Mr. Allen's article is so courteous, so temperate, and written with such evident intention and desire to be perfectly just to all concerned, and yet misses the mark so widely, that I feel called upon to examine it further; in doing which, I trust I may not fall behind my critic in the amenities; surely I hope not to. No seri-

[1] An article in The American Naturalist for January, 1876, x. 21–29, criticising my article "Fasti Ornithologiæ redivivi, No. 1," in Proc. Acad. Nat. Sci. Philadelphia, September, 1875, pp. 338–358.

ous disagreement can long subsist when each feels and shows the respect due to the other, and when neither is contending for himself, but for the truth and the general good.

Before proceeding further, I will dispose of the only point on which Mr. Allen has misrepresented me; let me hasten to add that I am sure he did so unintentionally. For he says that I advocate the adoption of certain names "whether they are accompanied by descriptions or not." But he did not really consider me guilty of such folly; what he meant was, whether accompanied by sufficient, formal descriptions, according to the usual interpretation of what constitutes a description. For reasons set forth at length in my paper, I hold that all of Bartram's species were in effect described. How inadequate many of his descriptions were is seen in the large number of unidentifiable species. Of course I admit this; but the *quality* of Bartram's descriptions is not a point at issue.

Next, I wish to bring prominently forward a strong and good point Mr. Allen makes, namely, that species, to be tenable, must be identifiable by something in the work itself in which they are named; it not being allowable to use knowledge subsequently gained to identify them upon a principle of exclusion, or any other process of cumulative circumstantial evidence. This is the gist of the sound count that my friend makes against me; for I certainly applied some of the knowledge which is the common property of ornithologists of 1875 to the identification of species proposed in 1791; and if this kind of reasoning, and the sort of "moral" certainty reached by its means, be ruled out as evidence, I should not wonder if, of the ten species I newly set up, no more than the six or seven Mr. Allen admits would be allowed to stand. I willingly concede the point, but, in paying my respects to Mr. Allen on this score, would simply ask him, What has this to do with the proposition of mine, that if any of Bartram's species are tenable, then all his fully identified, described, and binomially named ones are too?

The rest of Mr. Allen's critique may be summed under several heads, as follows: —

(1.) The general statement that Bartram was a pretty poor sort of an ornithologist after all. As an expression of his opinion, Mr. Allen has a perfect right to say so, and I should be the last to restrict the freedom of his judgment; but it is irrelevant to the case at issue. I think rather more highly of our author than Mr. Allen seems to, and in fact I wish we had no worse ornithol-

ogists to deal with, though there have been such before and since Bartram's time; but I never made his general standing as an ornithologist an argument in favor of adopting certain of his names. Yet this wholly uncalled-for attempt to depreciate Bartram's general ability as an ornithologist occupies much of Mr. Allen's paper.

(2.) Respecting our author as a binomialist: Those who are sufficiently interested may compare Mr. Allen's paper with mine on this point, to find that we agree exactly, though Mr. Allen has had recourse to the arithmetic of the case, which I did not consider necessary. If the figures should show that Bartram lapsed from binomial propriety every other time, instead of about once in every seven times, the circumstance would absolve no one who uses *Corvus carnivorus*, for instance, from using *Corvus frugivorus* too. This is, in substance, all I ever claimed.

(3.) Mr. Allen accuses Bartram, by implication, of giving correct names "when he happened to know them," otherwise of preferring to coin names as the easiest way out of a difficulty, not having the means of ready identification, or not caring to take the trouble required for determination. Now, in the first place, this is a gratuitous assumption that Bartram did not do the best he knew how, and, as such, surely indefensible from any standpoint. Secondly, supposing Bartram was a fraud, and did "gobble" all the species he could, what has that to do with the question? The fact that he did coin names simply imposes upon us the necessity of recognizing such of them as are binomial, are identifiable by description accompanying, and possess priority. His motives are not proper subjects of public inquiry. If all the species which early and late ornithologists have "borrowed" and printed as their own were canceled, what a relief it would be to the synonymical lists!

(4.) Mr. Allen inquires, with some warmth, whether this sort of thing "tends to the best interest of science." It may or may not, I reply, but I believe it does, and that time will show it does. At any rate, the reason Mr. Allen adduces for his belief that it does not is not a sound one. He says, "If the example Dr. Coues is here setting be followed, there will be no stability to our nomenclature for a long time, but only, except perhaps to a few experts, the most perplexing confusion." But I contend that the only possible road to stable nomenclature is that which leads to the very bottom of the matter. In the nature of the case, the process of striking "bed-rock" is desultory, uncertain,

and confusing; I admit, as I deplore, the inconvenience and the difficulty. But a fact is no less a fact because it is a disagreeable one; and whether we like it or not, the fact remains that names of species will continue to shift until the oldest one that is tenable according to rule is recognized. Therefore the sooner a species is "hunted down," the better; and this is just what I undertook to do in the cases of a few of Bartram's. I did it partly on the score of "justice" to that author, but this was not my main object. I am no sentimentalist in such matters, and if I thought it would be to the best interest of science to ignore Bartram, I should quietly do so. It is simply because I believe it best, in spite of transient inconvenience, to bring him to light, that I have done so, in an attempt to secure that very stability which Mr. Allen accuses me of disturbing. To speak my mind freely, I may add that I should have been disappointed, considering that I had signally failed, had not my paper made some disturbance; exactly that effect was anticipated and fully intended, otherwise the paper would not have shown *raison d'être*. And I am encouraged further to believe that the paper took its own step, however short, in the right direction, by the recollection that certain *Fasti* of my honored predecessor in this particular line of work, whose title I have had the presumption to revive, were received with wry faces and shrugs — and received, nevertheless. I am perfectly satisfied to let my own be tested in the crucible of time.

(5.) The remainder of Mr. Allen's paper is chiefly devoted to the examination, *seriatim*, of the individual cases in which I claim priority for Bartram. This portion of his paper is a fair and strong counter-argument to mine. It requires, however, no comment from me, since all this part of the subject, in which the general principle is not involved, is only left where I put it, in the hands of the experts, each of whom will determine for himself which particular ones of Bartram's names he can identify to his satisfaction, and which he cannot. Without here scrutinizing the cases in which I believe Mr. Allen to be wrong, I wish to acknowledge one instance in which he shows that I am probably wrong — the case of *Certhia pinus*, No. 10, which I now see is probably, as Mr. Allen says, *Helminthophaga pinus*, not *Dendræca pinus*, as I too hastily assumed.

Finally, let me say a word respecting Mr. Allen's suggestion taht I ought to have gone further, and attributed to Bartram the priority of discovery of the great law of geographical variation in

size, which recent naturalists have developed and formulated. I suspect that Mr. Allen allowed himself to become slightly quizzical at the close of his critique; but I shall take him at his word, and reply seriously. I do not find that Bartram presents anything but a statement of fact of the smaller size of Floridan animals as compared with those from Pennsylvania; to do which, nothing but a tape-line, or, failing that useful article, a good pair of eyes and fair memory, were requisite. Whereas, in treating of the same important subject himself, Mr. Allen has been prominent among those who have generalized from the facts to broad conclusions; and in so doing has displayed inherent powers of mind which, coupled with extensive and varied acquirements, have won for him the high position he now holds among American naturalists.

## RECENT LITERATURE.

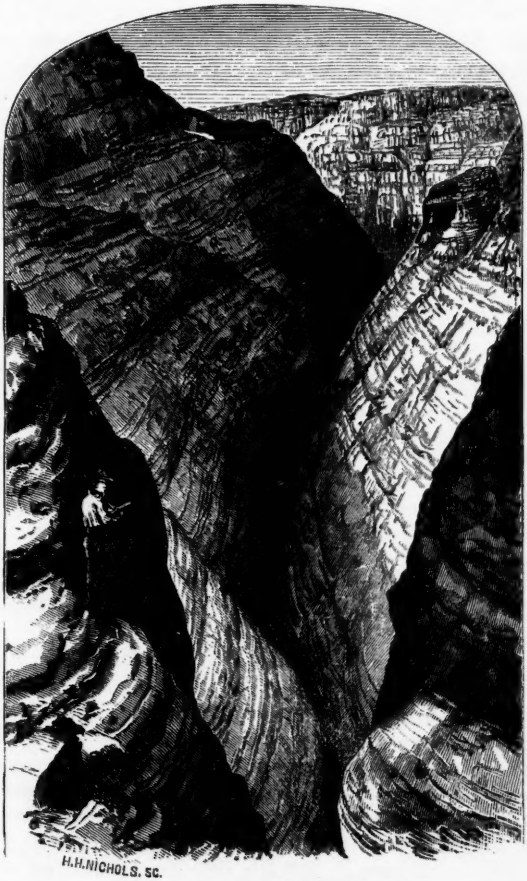
POWELL'S EXPLORATION OF THE COLORADO.[1] — The first part of this volume contains the personal narrative by Major Powell of his perilous and successful exploration of the most wonderful river-gorge in the world. The second part, containing his observations on the physical features of the Valley of the Colorado, will be noticed in a future number of this journal.

The narrative is one of the most thrilling records of personal adventure we have ever read; the interest of the reader is intense from the first to the last page, the story being told in a modest, unpretending way, so that the dangers do not seem exaggerated, and the impression produced by the rare exhibition of courage and endurance is not lessened by any straining for effect in the words of the narrator.

The cañon of the Colorado is over a thousand miles long, and at one point over a mile (6200 feet) in depth. This deep cut is broken at intervals by lateral cañons, where branches, such as the Grand, Yampa, Virgin, Kanab, and others, enter the main stream. An idea of the grandeur of these dark, solitary gorges, with vertical sides often nearly a mile high, and with pinnacles and towers overhanging the river winding like a silvery thread below, may be gained by a glance at the figures of Mukoon-tu-weap Cañon, of a cañon in Escalante Basin (Fig. 5.), but especially of the Grand Cañon. The bird's-eye view of the Terrace Cañons (Fig. 6) represents the relations of these cañons to the surrounding country.

[1] *Exploration of the Colorado River of the West and its Tributaries.* Explored in 1869, 1870, 1871, and 1872, under the Direction of the Secretary of the Smithsonian Institution. By J. W. POWELL. Washington, D. C. 4to, pp. 291. With Maps and Illustrations.

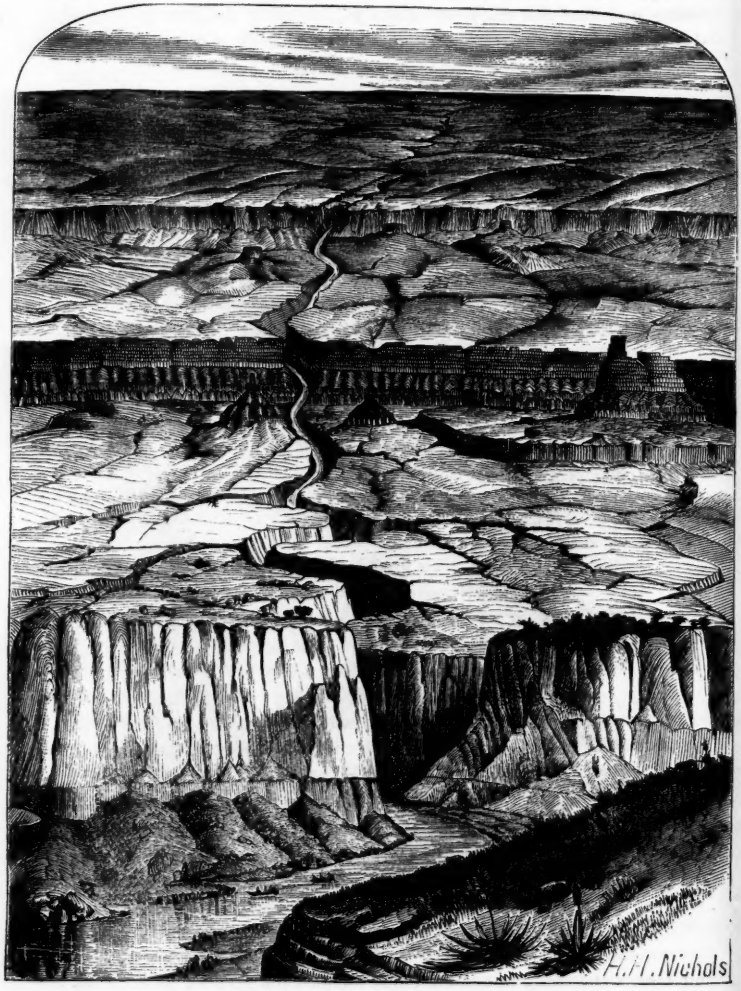
On the 24th of May, 1869, the expedition, in three boats, left Green River Station on the Union Pacific Railroad, and after floating down the river, shooting rapids, letting their boats down over falls, often upsetting, losing one boat and many provisions and instruments, haunted day after day with the sense of worse dangers ahead than those already overcome,




(Fig. 5.) CANON IN ESCALANTE BASIN.

and near the close, just as they had escaped the greatest peril of all, left apparently to their fate by three of the party, who escaped the dangers of the cañon only to be murdered by the Indians, they emerged on the 29th of August from the Grand Cañon of the Colorado, and the next day reached the Mormon settlements at the mouth of the Virgin River.

Near the Grand Cañon Mr. Powell met some of the Shi-vwits, a tribe of Ute Indians, more primitive than any other Indians seen on this continent by our author. They subsist on wild fruits, nuts, and native grains.




(Fig. 6.) BIRD'S-EYE VIEW OF THE TERRACE CANONS.

The *oose*, or fruit of the yucca or Spanish bayonet, which is rich, not unlike the paw-paw, they eat raw and roasted. "They gather the fruits of a cactus plant, which is rich and luscious, and eat them as grapes, or

from them express the juice, making the dry pulp into cakes, and saving them for winter; the wine they drink about their camp-fires, until the midnight is merry with their revelries.

"They gather the seeds of many plants, as sunflowers, golden-rods, and grasses. For this purpose they have large conical baskets which hold two or more bushels. The women carry them on their backs, suspended from their foreheads by broad straps, and with a smaller one in the left hand, and a willow-woven fan in the right, they walk among the grasses and sweep the seed into the smaller basket, which is emptied, now and then, into the larger, until it is full of seeds and chaff; then they winnow out the chaff, and roast the seeds. They roast these curiously: they put the seeds with a quantity of red-hot coals into a willow tray, and, by rapidly and dexterously shaking and tossing them, keep the coals aglow, and the seed tray from burning. As if by magic, so skilled are the crones in this work, they roll the seeds to one side of the tray as they are roasted, and the coals to the other. Then they grind the seeds into a fine flour, and make it into cakes and mush."

A chapter follows containing A Report on a Trip to the Mouth of the Dirty Devil River, by A. H. Thompson, which is succeeded by the second part, On the Physical Features of the Valley of the Colorado, while the third part is zoölogical in its nature, containing treatises by Dr. Coues and Mr. Goode.

Cope's Check-List of North American Batrachians and Reptiles.[1] — This is the first of a new series of works published by the Department of the Interior for the United States National Museum, under the direction of the Smithsonian Institution. Besides the check-list which will prove useful to students, Professor Cope enters into an elaborate discussion of the geographical distribution of the vertebrates, particularly the batrachians and reptiles, of the northern hemisphere. The author divides the earth's fauna into six realms, those of the northern hemisphere being the realm of the new world (Nearctic) and that of the old world (Palearctic). However well these terms (first proposed, we believe, by Dr. Sclater) may apply to the vertebrates, when we come to the insects and marine invertebrates the terms "Nearctic" and "Palearctic," as applied to the circumpolar region, seem to us to be somewhat artificial, though applying well to the north temperate hemisphere. The essay, however, will be found exceedingly useful and timely.

Kidder's Natural History of Kerguelen Island.[2] — The second Bulletin of the United States National Museum contains the notes on the birds of Kerguelen Island made by Dr. Kidder while attached as natu-

[1] *Check-List of North American Batrachia and Reptilia.* By Edward D. Cope. Bulletin of the United States National Museum. I. Washington, D. C. 1875. 8vo, pp. 104.

[2] *Contributions to the Natural History of Kerguelen Island.* By J. H. Kidder, M. D. Bulletin of the United States National Museum. II. Washington, D. C. 1875. 8vo, pp. 51.

ralist to the American Transit of Venus Expedition in 1874–75. The results are of much interest, as the climatic features of the island are peculiar, while there are no land birds or mammals, strictly speaking, indigenous to it, and but a single shore-bird (*Chionis minor*), though the island is about ninety miles long and fifty broad, with snow-covered mountains, the highest of which (Mount Ross) rises to an elevation of about 5000 feet. The birds observed were pelagic forms, such as gulls, albatross, penguins, etc. The species have been determined by Dr. Coues, whose synonymical and other notes give additional value to the essay.

THE ZOÖLOGICAL RECORD.[1] — Though it is nearly time for the appearance of the volume for 1874, it is perhaps not entirely too late for us to call the attention of our readers to the value of these yearly indexes to the literature of systematic zoölogy. They deserve an extended circulation in this country, where access to zoölogical works is limited, and students away from large libraries are obliged to use such a record. Possessing such a manual of recent zoölogical literature, and ascertaining what has been published in his special department, the isolated student can borrow from central libraries works of which he otherwise would be totally ignorant.

We notice that the last four volumes are much thinner than the early ones. Is this a sign of the zoölogical millenium when all the new species and genera shall have been described, and students will be forced to study the anatomy, physiology, and development of animals?

SCUDDER'S FOSSIL BUTTERFLIES.[2] — This beautifully printed and illustrated memoir is the result of a critical and extensive examination of the specimens of fossil butterflies existing in European museums, none having yet occurred in this country. After describing the fossils with minuteness, and elaborately comparing them with related forms now living, the author discusses the comparative age of fossil butterflies, the probable food-plants of tertiary caterpillars, and the present distribution of butterflies most nearly allied to the fossil species, besides noticing such insects as have been erroneously referred in recent times to butterflies.

It appears that nine well-authenticated species of butterflies are now known, all from the European Eocene and Miocene tertiary formations, and that they represent all the families of butterflies except the *Rurales*, represented by the *Lycænæ*. Of the allies of the nine fossils forms, four now live in the East Indies, three in America, on the confines of the tropical and north temperate zones, one in the north temperate zone of Europe, Asia, and America, and one on the shores of the Mediterranean.

[1] *The Zoölogical Record* for 1872. Edited by ALFRED NEWTON. 8vo, pp. 495. The same for 1873. Edited by E. C. RYE. London: John Van Voorst. 1875. 8vo. pp. 543.

[2] *Fossil Butterflies.* By SAMUEL H. SCUDDER. Memoirs of the American Association for the Advancement of Science. I. Salem, Mass. 1875. 4to, with 3 steel plates; pp. 99. $1.00. For sale by the Naturalist's Agency, Salem, Mass.

Three out of the four species whose living allies occur in the East Indies come from the older deposits of Aix, and only one of the two remaining Aix species shows special affinities to American types. "We thus find here," the author remarks, "as among other insects and among the plants, a growing likeness to American types as we pass upward through the European tertiaries."

This handsome memoir appears in print through the generosity of Mrs. Elizabeth Thompson, of New York city, who generously gave the sum of one thousand dollars for the promotion and publication of original investigations by members of the association. The results in every way prove the wisdom of the donation, and we express the hope that similar benefactions may follow from other sources.

SACHS'S HISTORY OF BOTANY.[1] — Under the patronage of the King of Bavaria, the Royal Academy of Sciences is publishing a History of Modern Science in Germany. The treatment of the individual sciences has been entrusted, by a special commission, to men eminent in their respective departments. This volume is one of the earliest of the series. Professor Sachs, of Würzburg, well known as a high authority in vegetable physiology, and more widely as the author of A Text-Book of Botany, was selected to write the history of botany. The history is given in three books. The first treats of morphology and systematic botany, and covers the period from Otto Brunfels (1530) and Fuchs (1542), down to 1860. The most interesting chapters are those devoted to morphology as influenced (1) by the theory of metamorphosis and the spiral distribution of leaves (1790–1850), and (2) by a fuller knowledge of the cell and the lower grades of plants, and (3) by the theory of development (1840–1860). Professor Sachs looks upon the work done during the twenty years just mentioned, as having freed morphology and systematic botany from their old prejudices; sight has become clearer, the methods of investigation safer, and the manner of putting questions sharper.

The second book sketches the progress of vegetable anatomy from Malpighi and Grew (1671–1682) down to the time of Nägeli. The author justly regards Von Mohl and Nägeli as having together placed this division of botany on a secure foundation. The molecular theory of the latter is considered the basis of modern vegetable physiology.

To this subject the third book is devoted. The conflicting views which have been held respecting reproduction, nutrition, and the dynamics of plants are fully presented and with great fairness. It is hardly possible to detect any partiality in this remarkable section. It remains to be noticed that this history is not confined to botany in Germany; Germans may, however, well be proud of the large and honorable share which their countrymen are here shown to have taken in the advancement of the

[1] *Geschichte der Botanik vom* 16 *Jahrhundert bis* 1860. Von DR. JULIUS SACHS. München. 1875. (A History of Botany from the 16th Century to 1860. By DR. JULIUS SACHS. Munich. 1875.)

science, and they may congratulate themselves upon the selection of an historian who has not ignored the claims of other nations.

THE OCTOPUS.[1] — This is a pleasant account of the Octopus or poulpe, adapted to the mind of the average visitor at the immense aquarial establishments of the sea-ports of England, and perhaps worth reading on this side of the water, where poulpes — "these blasphemies of creation against itself," as Victor Hugo styles them — are common enough southward, but fashionable colossal aquaria are as yet lacking.

EDWARDS'S BUTTERFLIES OF NORTH AMERICA.[2] — The fourth part of the current series of this magnificent work, issued from the Riverside Press at the end of December last (but dated November), contains fewer subjects than usual, two whole plates being given to illustrate the history of *Melitæa Phaeton* and *Papilio brevicauda*. The former plate is perfect as far as the colored figures are concerned, and cannot be surpassed, if it can be equaled, by the best of foreign work; but the plain lithograph of the web is not so satisfactory, showing in but few places any indication of the web-like structure. The other plates contain three species of *Argynnis* (*A. Eurynome*, *Bischoffi*, and *Opis*), and two of *Grapta* (*G. Hylas* and *Marsyas*). The text accompanying the three plates given to these insects is mainly descriptive, but contains some strictures on Mr. Scudder's classification of these species of *Grapta*. The accounts of *Phaeton* and *brevicauda*, on the other hand, are very full, and are welcome additions to the history of our butterflies. That of the former is very nearly complete, but contains a few errors; for instance, in the statement that the rows of hair-bearing tubercles of the newly hatched caterpillar "indicate the position of the future spines." It has long since been pointed out (*Canadian Entomologist*, March, 1872) that this is not the case, the position of few or none of the spine-bearing eminences of the mature caterpillar corresponding with those of the previous hair-supporting tubercles. These are points of structure to which the author pays little attention, but which are very important in their bearing upon the affinities of butterflies.

In writing that "*Phaeton* alone, out of a hundred species of butterflies that frequent our fields," protects itself in the larval stage "in a web woven by the community," Mr. Edwards seems to be unaware that this is the case with every one of the tribe to which *Phaeton* belongs, as far as their history is known, and will therefore doubtless prove true of the few species of Eastern North America whose history has not yet been fully elucidated. It is also true of some other of our common butterflies.

[1] *The Octopus, or the Devil Fish of Fiction and of Fact.* By HENRY LEE. With Illustrations. London. 1875. 12mo, pp. 114. For sale by the Naturalist's Agency, Salem.

[2] *The Butterflies of North America.* With Colored Drawings and Descriptions. By WM. H. EDWARDS. Boston: H. O. Houghton & Co. 4to. $2.50.

The food-plant, *Viburnum dentatum*, given on the authority of Mr. Glover (doubtless borrowed from Dr. Packard) is probably a mistake. The caterpillar of *Phaeton* has been found upon a great variety of plants, such as Aster, Corylus, Berberis, Solidago, Vernonia, Clematis, and Rubus, and even upon ferns, grasses, and flags; but this is to be accounted for simply by the roving disposition of the caterpillar.

It is strange that Mr. Edwards makes no allusion whatever to the very careful account of the history of this insect given three or four years ago by Mr. Lintner.

Recent Books and Pamphlets. — The Native Races of the Pacific States of North America. By Hubert Howe Bancroft. Vol. V. Primitive History. New York: D. Appleton & Co. 1876.

Birds of Western and Northwestern Mexico, based upon Collections made by Colonel A. J. Grayson, Captain J. Xanthus, and Frederick Bischoff. By George N. Lawrence. (Memoirs of the Boston Society of Natural History.) 4to, pp. 54.

Zoölogical Results of the Hassler Expedition. II. Ophiuridæ and Astrophytidæ, including those dredged by the late Dr. William Stimpson. By Theodore Lyman. With five Plates and five Figures printed in the Text. (Illustrated Catalogue of the Museum of Comparative Zoölogy, No. 8.) 4to, pp. 34.

Neomenia, a new Genus of Invertebrate Animals described by Tycho Tullberg. With two Plates. (Proceedings of the Royal Swedish Academy of Sciences, May 12, 1875.) 8vo, pp. 12.

On the Osteology and Peculiarities of the Tasmanians, a Race of Man recently become extinct. By J. B. Davis. (From the Transactions of the Dutch Society of Sciences, of Haarlem.) 1874. 4to, pp. 20. Two Plates.

Geological Notes. I. On the Newport Conglomerate. II. On the Gravel and Cobble-Stone Deposits of Virginia and the Middle States. (From the Proceedings of the Boston Society of Natural History.) Boston. 1875. 8vo, pp. 13.

Remarks on Canker-Worms and Description of a new Genus of Phalænidæ. By Charles V. Riley. (From the Transactions of the St. Louis Academy of Sciences.) 8vo, pp. 15. St. Louis. November 5, 1875.

Notes on the Natural History of the Grape Phylloxera (*P. vastatrix* Planchon). By Charles V. Riley. 8vo, pp. 7.

Ueber die Umwandlung des Mexicanischen Axolobt in ein Amblystoma. (Siebold und Kölliker's Zeitschrift, xxv.) 8vo, pp. 37. 1875.

Rectification of the Geological Map of Michigan, embracing Observations on the Drift of the State. By Alexander Winchell. Salem. 8vo, pp. 26.

Botanical Bulletin. Vol. I., No. 1. November, 1875. John M. Coulter, editor, Hanover, Ind. $1.00 a year. Monthly.

An Illustration of North American Agrotis and Oncocnemis. By Leon F. Harvey. With a photographic plate. 8vo, pp. 4. Buffalo, N. Y. 1876.

On Noctuidæ from the Pacific Coast of North America. By A. R. Grote. With a photographic plate. 8vo, pp. 10. Buffalo, N. Y. 1876.

The Spiders of the United States. By N. M. Hentz. (Occasional Papers of the Boston Society of Natural History, II.) With 21 plates. 8vo, pp. 171. Boston. 1875. Paper, $3.00; cloth, $3.50.

Pisciculture. An Address on the Artificial Breeding of Fish, their Habits, etc., delivered before the Detroit Scientific Association. By N. W. Clark. Detroit. 1875. 8vo, pp. 20.

Bulletin of the United States Geological and Geographical Survey of the Territories. No. 5, second series. 8vo, pp. 233–414. Washington, D. C. January 8, 1876.

## GENERAL NOTES.

### BOTANY.[1]

EXOTIC PLANTS AROUND SAN FRANCISCO BAY. — Many of the species of the Australian eucalypti and acacias mature their seeds in the climate of the shores and neighborhood of San Francisco Bay; many of the foreign geraniums and fuchsias also seed and fruit in the open air, though exposed more or less to the trade-winds; this is notably the case at the university grounds at Berkeley, which are in a line due east from the Golden Gate. — R. E. C. STEARNS.

PREISSIA COMMUTATA. — In a communication to the editor, Mr. Henry Gillman reports *Preissia commutata* (liverwort) at Laughing Fish River, and Eagle River, Michigan, at White-Fish Bay, Wisconsin, and several other localities on the Lakes. The plant occurs chiefly on sandstone.

SEQUOIA SEMPERVIRENS. — The statement on page 571 of the NATURALIST for 1875, of the discovery of a grove of colossal redwood trees, *Sequoia sempervirens*, proves to have been a hoax.

Very large specimens of this species are occasionally met with in the forests of the Coast Range. Six miles east of Stewart's Point and twenty-three miles west of Healdsburg, in Sonoma County, a fine specimen may be seen on the farm of James McCappin; it is not far from three hundred feet in height, and reaches up about one hundred feet to the first limb; it is quite straight and symmetrical, and measures seventy-one feet four inches in circumference at one foot from the ground; seven feet higher the circumference is forty-six feet. — R. E. C. STEARNS.

ÆSTIVATION OF THE FUCHSIA. — "In the books," the petals of the fuchsia are described as convolute. At my request, one of my students examined one hundred and fifty-nine flowers of various species, hybrids, and varieties. The petals exhibited sixteen different modes of arrangement with reference to each other. Only twenty-eight, about one sixth, were regularly convolute; of these, twenty-one twisted to the right, and seven to the left. Seventy-five flowers, nearly half of all examined, had one petal outside at each edge, the others in regular order. In thirty-seven cases, one petal was entirely outside, the one opposite to it had both edges covered by those next to it.

The foregoing remarks are kindred to those on Phyllotaxis of Cones, in the NATURALIST, vii. 449, and on Imbricative Æstivation, viii. 705. — W. J. BEAL.

VALLISNERIA SPIRALIS. — This plant, growing in moderately deep water in the south of Europe, has long been a favorite object of cultivation in aquaria, from the clearness with which the rotation of the protoplasm

[1] Conducted by PROF. G. L. GOODALE.

can be made out in the cells of the leaves, and the remarkable phenomena connected with its mode of fertilization, though the latter is less often witnessed, owing to the comparative rarity of the male plant. At a recent meeting of the Linnæan Society, of London, Mr. A. W. Bennett read a paper on the phenomena connected with the development of the peduncle of the female flower. This attains a final length of from three to four feet, and the rapidity of its growth is perhaps unequaled in the vegetable kingdom, being at its most rapid period at the rate of twelve inches in twenty-four hours. By marking off and measuring from time to time equal portions of the peduncle as they developed above the surface of the water, Mr. Bennett determined that the greatest activity of growth is displayed by the terminal portion of the flower-bud. A marked length of 2 inches from the flower-bud increased to 6.5 inches during the time that the remainder of the peduncle increased from 8.7 to 21.25 inches, showing a greater energy in the former case in the proportion of three to two. This presents a greater analogy to what is known to be the ratio of development of different parts in the case of roots than in the case of aerial stems, in which the zone of greatest activity of growth is generally at some considerable distance from the apex. Very few observations have, however, been made on the relative rate of growth of different portions of the same internode. When unfertilized, the peduncle of the female flower does not coil up and withdraw the flower below the surface, as is the case when pollen from a male flower has had access to it, but floats in a wavy manner on the surface; and under these circumstances the female flowers remain open for days and even weeks, as if waiting for the male flowers. — A. W. Bennett.

Insectivorous Plants. — An interesting series of experiments confirmatory of the power stated by Darwin to be possessed by the leaves of *Drosera*, of absorbing nourishment through their glands, has been made by Dr. Lawson Tait, of Birmingham, England. He placed side by side plants of the common *D. rotundifolia*, some in the normal state, others with the roots pinched off close to the rosette of leaves, and with the leaves all buried, only the budding flower-stalk appearing above the sand; others with the roots and flower-stalk left on, but all the leaves pinched off, the roots being buried in the sand; and others again with the roots left on but appearing above the sand, some of the leaves buried and others exposed. These plants were all carefully washed with distilled water before being planted in silver sand which had been deprived of all organic matter, and carefully watched to prevent flies being caught; they were then fed, some with pure distilled water, others with a strong decoction of beef, and others with a very dilute solution of phosphate of ammonia. The conclusions arrived at from the series of experiments were that the plant can not only absorb nutriment by its leaves, but that it can actually live by their aid alone, and that it thrives better when supplied with nitrogenous material in small quantity. The nitrogenous

matter is more readily absorbed by the leaves than by the roots, overfeeding killing the plant sooner through the leaves than through the roots alone, although the roots also certainly absorb nitrogenous matter. Dr. Tait had announced, independently of Mr. Darwin, the separation of a substance closely resembling pepsin from the viscid secretion of the glands of *Drosera dichotoma.*

In the September number of the (London) *Journal of Botany*, Mr. J. W. Clark details another important independent series of experiments with a similar result. He obtained large quantities of plants of *Drosera rotundifolia*, and a smaller quantity of *Pinguicula lusitanica*, and fed the leaves with the bodies of freshly-killed flies soaked in a solution of citrate of lithium. The needful precautions being taken to prevent the solution from being carried mechanically to other parts of the plant, after an interval of forty-five or fifty hours various portions of the plant were incinerated, and the ashes tested for lithium by the spectroscope. The result proved conclusively that the products of digestion, after absorption by the leaves, do enter the leaf-stalk, and are thence distributed to other parts of the plant. — A. W. Bennett.

The Life-History of Moulds. — A most important contribution to our knowledge of the lower forms of life is contained in Dr. Oscar Brefeld's Botanische Untersuchungen über Schimmelpilze (translated by Dr. W. R. McNab in the *Quarterly Journal of Microscopical Science* for October), containing an account of a series of very close observations on the life-history of *Penicillium glaucum* and others of the commonest moulds belonging to the same genus. Besides the well-known non-sexual mode of reproduction by conidia, Dr. Brefeld detected also on the mycelium bodies which he terms "sclerotia," the products of a sexual process. These contain the germ of a second generation produced from the fertilized carpogonium. There are therefore in *Penicillium* two stages or alternations of generations. The first or sexual generation is large, and capable of producing non-sexual spores. The second or non-sexual generation is small, and lives as a parasite on the nutrient tissue which surrounds it in the form of a sclerotium or sporocarp, which after a time develops asci and ascospores, these latter again producing the first sexual generation. This formation of ascospores seems to show that *Penicillium* must be placed in the group of Ascomycetes; and Brefeld considers that, from the striking resemblance of the minute structure of the sclerotia of *Penicillium* to that of the common truffle, this genus of moulds must be placed close to the Tuberaceæ. — A. W. Bennett.

Fungi heaped up in Pines by Squirrels. — Mr. J. S. Fay has sent us specimens of a fungus which he finds heaped up in considerable buantities in the crotches of young pine-trees not more than ten or twelve feet high, at Wood's Hole, Mass. Mr. Fay at first supposed that these heaps were accidental, but is now convinced that they were made either by squirrels or blue jays. The fungi are *Boleti*, and, as far as can

be determined from their present condition, all of one species. There are several species of *Boletus* found at Wood's Hole, but they all grow on the ground. The most probable supposition is that the heaps were made by squirrels, and it would be interesting to know whether they actually eat the fungi. Perhaps some reader of the NATURALIST may be able to settle this point. — W. G. FARLOW.

MESSRS. H. O. HOUGHTON & CO., of the Riverside Press, design publishing shortly a series of sketches of the wild flowers of North America, from studies by the well-known botanical artist, Mr. Isaac Sprague. Those who are familiar with the accurate work of this skillful artist, particularly with his recent illustrations in Mr. Emerson's Trees and Shrubs of Massachusetts, will welcome the promised plates. Each portfolio of four colored plates is to be accompanied by descriptive letter-press, in which the more interesting details of structure and the habits of the plants will be explained.

BOTANICAL PAPERS IN RECENT PERIODICALS. — *Bulletin of the Torrey Botanical Club*, New York, December, 1875. *Epiphegus Virginiana* var. Rauana. (A description, by Mr. Austin, of an unusual form of beech-drops. The variation is believed by the editor to be due to feeble development.) *Omphalaria pulvinata* Nyl., a lichen new to North America, has been found at Poughkeepsie by Mr. W. R. Gerard.

*Botanical Bulletin*, December, 1875. Professor Porter gives a short list of double wild flowers. Several notes of local interest.

*Comptes rendus des Séances de l'Académie des Sciences*, lxxxi. 19. On exhaustion of the soil by apple-trees, by Is. Pierre. 20. On the theory of carpels, by Trécul. (A study of the pistil in one of the Amaryllis family.) 21. On fibres of remarkable length and tenacity, by Is. Pierre (from *Lavatera*, of the Mallow family). On fixation of atmospheric nitrogen in soils, by Truchot. On the formation, structure, and breaking-down of the swellings in the grape-vine produced by *Phylloxera*, by Cornu. On production of sugar in the beet-root, as affected by loss of foliage, by Cl. Bernard. Villiane, Duchartre, Boussingault, and Pasteur have notes on the same subject. On hydrated cellulose, by Girard. 24. On the destruction of vegetable substances mixed with wood, by Barral and Salvesat.

*Flora*, 1875, No. 27. Dr. Luerssen continues his description of the vascular Cryptogamia collected by Dr. Wawra in the Sandwich Islands. No. 28. Description of some lichens new to Europe, by W. Nylander.

*Botanische Zeitung*, November 12, 1875. Reports of societies: The association at *Graz:* Kirchner gave some account of the botanical works of Theophrastus, especially the volume on Vegetable Physiology. This was described as being marked by fullness of detail, and indicating acuteness in investigation. An annotated German translation is now promised. Von Ettingshausen gave reasons for believing that *Castanea*

*vesca* is descended from *Castanea atavia*. No. 47. On the marine Phanerogams of the Indian Ocean and Archipelago, by Naumann. (An account of the flowering plants found in salt water during the cruise of the Gazelle.) Nos. 48, 49. Contributions to the history of the development of the Sporogonium in liverworts, by Kienitz-Gerloff. In reports of societies: *Berlin:* Ascheron on the distribution of the sexes of *Stratiotes*, a plant allied to *Sagittaria*. (The pistillate and staminate plants are for the most part widely separated.) Nos. 50, 51. On the development of cambium, by Dr. Velten. (Examining N. J. C. Müller's views.) In reports of societies: *Brandenburg:* Braun on the morphological nature of the tendrils in the gourd family (regarding them as leaves, and in divided tendrils each division as one leaf). *Berlin:* Brefeld on conjugating fungi.

*Sitzungsberichte der kaiserlichen Akademie der Wissenschaften*, lxx. i. Contributions to the morphology and biology of yeast, by Emil Schumacher, of Lucerne (detailing experiments to determine the influence of low temperature, etc., upon the life of the yeast plant). Lxx. ii. Investigations respecting the occurrence of lignin in the tissues of plants, by A. Burgerstein. (Experiments with aniline sulphate, by which he determined the absence of lignin in fungæ and algæ. It is found in a very few plant-hairs, in all wood-cells, but never in cambium. Many bast-cells have considerable lignin, but the sieve-cells hardly any. The most curious observation was that the walls of pith-cells in many plants are lignified, and the medullary rays also.

## ZOÖLOGY.

Breeding Range of the Snow-Bird. — During a flying visit paid to the mountains of Southwestern Virginia, the latter part of June, I found *Junco hyemalis* very common on the summits, at an altitude of forty-five hundred feet. A nest containing three eggs, about to hatch, was discovered within a stone's throw of the house. It was built on the ground, in a hole in a slight embankment. The mother-bird fluttered in sight within a few feet of me, of course rendering the identification absolute; besides, the birds were plentiful in the vicinity, and well known to the most obtuse of the aborigines of this primeval region. The southern extension of the species during the breeding season has only lately become known. Professor Cope mentions it in a former paper in the Naturalist, and I have no doubt that he is right in crediting the species with a breeding range to the mountains of Georgia. This circumstance of its distribution explains the sudden appearances and disappearances of the species, according to the weather, during the colder portions of the year, at low levels. It can readily change its summer for its winter abode, and conversely, by a few hours' flight.

While on this subject, let me allude to the slip of the pen, or momentary aberration of mind, I don't know which, that led me to give the

"Graylock range" as an instance of the southward dispersion of this bird in the breeding season, at page 141 of the Birds of the Northwest. The proper allusion is to some mountains in North Carolina. — E. C.

Homologies of Mammalian Teeth. — Professor Cope has recently investigated the homologies of the different types of mammalian teeth. He refers all of them to four types, the haplodont, ptychodont, bunodont, and lophodont. The first is a simple cone or truncate cylinder in form, and from it all the others are derived by folding vertically (ptychodont) or transversely. The lophodont teeth are the most complex, and consist of various modifications of the bunodont type. The bunodont tooth has the summit of the crown composed of obtuse tubercles, which may be high or low or flattened in different ways. The odd-toed hoofed mammals have the outer tubercles flattened so as to have a crescentic or V-shaped section, and the inner tubercles are either simply conic or connected with the outer by cross-crests of various character. The rhinoceros, tapir, Symborodon, etc., possess such teeth. The ruminating animals, on the other hand, have both the inner and outer crests much flattened, so as to be crescent-shaped in section, and they are also much elevated, so as to leave deep valleys between them, which are often filled up with cement.

The flesh teeth of the lower jaw of carnivora were shown to be derived from a simple tubercular (bunodont) tooth with four cusps, by a process of change which is to be chiefly observed among Eocene carnivora. Professor Cope finds that some of these add a small fifth tubercle, and that this is connected with the outer front one of the four by a low ledge. Successively the two hinder tubercles disappear, and the front or fifth grows larger. The ridge connecting the latter with the outer grows longer and higher, and the inner front then disappears. Finally the hinder part of the tooth disappears also, leaving but two apices connected by a cutting edge, which is characteristic of the flesh-tooth of the lion and tiger.

The human molar tooth is one of the simpler forms of the bunodont division.

Protective Resemblance in the Yellow-Bird. — On passing an embankment of the Grand Trunk Railway at Fort Gratiot, Michigan, one warm day in August, 1872, we noticed that numbers of the yellow-bird (*Chrysomitris tristis* Bon.) had collected where an extensive growth of the common mullein (*Verbascum thapsus* L.) lined the slope. Each bird had perched on the apex of a spike of the blossoms, the color of which was almost the identical shade of yellow in the plumage of the bird. The mulleins were ranged in stiff files, like soldiers in yellow uniforms, and each bird, as we passed, remained motionless, looking like a continuation of the spike, of which one might be easily deceived into thinking it part and parcel. As soon as we had passed by, the birds were again busy, flitting from plant to plant, feeding on the seeds, and enjoying themselves.

We could not avoid thinking that there was a meaning in the action here described, significant of an established protective habit, especially considering the decided changes of plumage assumed by this species at different seasons of the year. — HENRY GILLMAN.

SHELLS OF KERGUELEN ISLAND. — The naturalists connected with the Transit of Venus Expedition have begun to make their reports.

In the report of Dr. J. H. Kidder, of the Kerguelen station, now in press, Mr. W. H. Dall contributes a list of the mollusca collected, describing three new genera. One of these was described in a late number of the *Annals and Mag. Nat. Hist.* by Mr. E. A. Smith, of the British Museum, under the name *Eatonia*, long since preoccupied by Hall for a genus of brachiopoda. For this Mr. Dall substitutes *Eatoniella*. Mr. Dall also describes a genus allied to *Ceropsis* of the *Carditidæ*, but smooth and without lateral teeth, and with a semi-internal ligament, giving it the name *Kidderia*, in honor of the naturalist of the expedition. Dr. P. P. Carpenter also describes a new genus of chitons, with the anterior and posterior valves marginate, but not slit, and the other valves without a margin. This genus, intermediate between *Hanleia* and the articulate chitons, he calls *Hemiarthrum*.

## ANTHROPOLOGY.

JASPER WAR-CLUB TEETH. — In the sixth volume of the NATURALIST, page 157, fig. 24, I described a large flint implement as a hatchet. Such specimens I have since been led to consider as teeth, if I may so call them, of war-clubs; the handles of which were frequently the femora of the elk and bison. This form may be briefly described as obtusely pointed, short, and broad jasper implements; evenly chipped to a well-defined edge. Average-sized specimens measure about three to four inches in length, by two and a half to three in breadth. While the chipping is not as fine as in arrow and spear points, it is certain that the majority, at least, are finished implements, as suggested by the author of Flint Chips (p. 439), and not merely "blocked out" masses of jasper, to be subsequently worked into spear-heads and similar forms (see Rau on Agricultural Implements, Smithsonian Annual Report, 1868, p. 401). Besides these finished specimens, I have found that the larger flint implements, which I have considered to be either "lance-heads" (Proc. Acad. Nat. Sci. of Philadelphia, 1860, p. 278) or agricultural implements when blunt and broad, and weapons when narrower and pointed, in vol. vi. of this journal, page 155, fig. 22, — that these, when broken in half, were subsequently utilized as I have suggested, just as broken arrow-heads were occasionally made available, by conversion into scrapers (see this journal, vii. 500), except that in the latter instance the base of the broken implement was used, and in the former, the pointed or upper half. My reason for considering them as the teeth of war-clubs is that the point, although blunt, is well defined, and the

edges equally so, and that the implement as made was intended for penetration rather than cutting, but necessarily by the aid of a handle, inasmuch as the base has a roughly chipped edge, which would prevent its being used effectively if simply held in the hand. Certainly as a simple cutting implement or hatchet it would not have been pointed. This supposed use of these specimens, as described, is confirmed by the discovery lately of three specimens of such implements in Indian graves. Each of these chipped flints had evidently been inserted into long bones (femora) of some large mammal. The bones themselves had so nearly decayed that only minute fragments could be gathered, but the outline was distinguishable as the relic lay in the ground. Two of these specimens of flint teeth had evidently been wrought *de novo* from the mineral; the other was as evidently the pointed half of a lance-head, or hoe, the base being a single surface, showing that the specimen had there been broken directly in two. Somewhat confirmatory also of this view of the use of such relics is the fact that of the broken specimens of "lance-heads" found lying on the surface of the ground, the vast majority are the bases; the points having been gathered and utilized, I believe, in the manner suggested. War-clubs of wood, armed with a metal tooth, are now seen among the Indians. Catlin, in his North American Indians, vol. ii., plate 150, figures such an one, and frequently refers to them throughout that work. Prior to the introduction of metals, war-clubs were of course common, but armed with stone instead of iron. The jasper implements above described, I doubt not, were the forerunners of the metal teeth of the modern club. — CHARLES C. ABBOTT, M. D.

OPENING OF A ROYAL BURIAL MOUND IN DENMARK. — The Royal Society of Northern Antiquaries at Copenhagen has recently published a beautifully illustrated folio volume containing a description of a royal burial mound or barrow, with translations of the Runic inscriptions on stones, at Jellinge, of the time of the royal pair, Gorm and Thyra.

## GEOLOGY AND PALÆONTOLOGY.

THE EARLIEST EDENTATES (SLOTHS). — The earliest sloths hitherto known have occurred in the Miocene Tertiary. Professor Gaudry has recently announced to the French Academy traces of the existence of edentate mammals at the beginning of the Miocene epoch. The remains consist of a first phalanx and an ungueal phalanx, which seem to come from the same finger. He places this new animal in the genus *Ancylotherium*, with the specific name of *priscus*. The fossils have been found in the same bed, suggesting that the edentate in question has lived at the time of the lower Miocene as well as at the last phase of the Eocene.

A FOSSIL SIRENIAN ANIMAL IN JAMAICA. — The former existence, in Jamaica of an animal of this group, rather smaller than the manatee is indicated by the skull and atlas vertebra, described by Professor Owen

under the name of *Prorastomus sirenoides* in the *Quarterly Journal of the Geological Society of London.*

Geology of New Caledonia. — In an article on the metallic mines of New Caledonia, by Rev. W. B. Clarke, besides a notice of the mines of chromic iron and nickel, there is given, in *La Revue Scientifique*, a *résumé* of the geology of these islands.

## GEOGRAPHY AND EXPLORATION.

United States Coast and Interoceanic Surveys. — The late annual report of Commodore Ammen, Chief of Bureau of Navigation, states that the work of geographically determining as many points as are supposed necessary, in Central America and in the West Indies, was prosecuted last year by the United States steamer Fortune, and this year by the Gettysburg. The longitude of Panama, Aspinwall, Santiago de Cuba, and Havana have been determined by means of the telegraph. The work now in course of completion will include points on the Windward Islands and the northern coast of South America. The survey of the outer coast of the Peninsula of Lower California, and that of the Gulf of California, had been concluded by Commander George Dewey, commanding the Narragansett. The gulf was previously unsurveyed, but has now been sufficiently examined and determined for the safety of navigation. Commander A. J. Mahan, commanding the Wasp, has made much-needed surveys at the mouth of the Rio de la Plata.

It is recommended that when a vessel can be spared for the purpose from those employed on the North Pacific Station, a running survey be made of the coast of Gautemala. This would render the surveys (of different values) continuous from Behring's Straits to Cape Horn. Since completing the lines of deep-sea soundings in the Pacific Ocean for cable purposes, another line has been run by the United States steamer Tuscarora, under the command of Commander Herber, from San Francisco to the Sandwich Islands, and some soundings were also made on the return of the said vessel from the Navigator Islands to Honolulu.

In regard to interoceanic surveys, this work, which has been carefully prosecuted for five seasons by two or more parties from the Isthmus of Tehuantepec to twenty or more miles south of the mouth of the Napipi, on the River Atrato, is at length satisfactorily accomplished. Since the last report a careful survey of the Isthmus of Panama has been made, the computations completed, and the whole placed before the Interoceanic Canal Commission.

The Tundras of Siberia. — The prevalent idea that the plains of Siberia are frozen the year around is dispelled by Nordenskiöld in his account of his Siberian journey, to be found in *Nature*. "We were yet far north of the Arctic Circle, and as many imagine that the region we had now passed through, the so little known tundra of Siberia, is a desert waste,

either covered by ice and snow or by an exceedingly scanty moss vegetation, it is perhaps the place here to declare that this by no means is the case. On the contrary, we saw, during our passage up the Jenisei, snow only at one place, a deep valley cleft of some fathoms' extent, and the vegetation, especially on the islands which are overflowed during the spring floods, was remarkable for a luxuriance to which I had seldom before seen anything corresponding.

"The fertility of the soil and the immeasurable extent of the meadow land, and the richness of the grass upon it, had already called forth from one of our hunters, a middle-aged man, who is owner of a little patch of land between the fells in Northern Norway, a cry of envy of the splendid land our Lord had given 'the Russian,' and of astonishment that no creature pastured, no scythe mowed the grass. Daily and hourly we heard the same cry repeated, though in yet louder tone, when we some weeks later came to the lofty old forests between Jeniseisk and Turuchansk, or to the nearly uninhabited plains on the other side of Krasnojarsk, covered with deep *tschornosem* (black earth), in fertility certainly comparable to the best parts of Scania, in extent exceeding the whole of the Scandinavian peninsula. This direct expression of opinion by a veritable if unlearned agriculturist may perhaps not be without interest in judging of the future of Siberia."

The Swedish Expedition to Novaya Zemlya. — In our last number we gave some account of Nordenskiöld's expedition. His ship, the Prören, which he placed under the command of Dr. Kjellman, has returned to Norway. *Nature* reports that the party found an abundance of marine vegetation in the Kara Sea, which has been hitherto thought to be remarkably destitute of vegetable life. "We have," the letter to the Stockholm daily paper concludes, "during this summer sailed over known and unknown seas more than six thousand (English) miles; we have visited regions whither expeditions for more than three hundred years have attempted in vain to come; we have made rich collections in all departments of natural science." Nordenskiöld, who is the distinguished professor at the Royal Swedish Academy of Stockholm, reached St. Petersburg on the 17th of November, having journeyed overland from the mouth of the Jenisei River. An account of his journey appears in *Nature* for December 2d.

The Kybale Race. — An exhaustive monograph of this people (La Kybalie et les Coutumes Kabyles), in three large octavo volumes, by MM. A. Hanoteau and A. Letourneau, has been noticed in successive numbers of the *Revue Scientifique*. These Kybales are the descendants of the ancient Numidians, and their country forms a part of Algeria.

Pictures of Yünnan. — Under this title F. Garnier has published a work on this inland province of China, abstracts of which, with fine views of the striking scenery of the country and the people, are appearing in *Globus*, a weekly German journal of travel.

MEXICAN MIGRATIONS. — At the Exposition International de Géographie held at Paris last year, Professor Quatrefages exhibited an unpublished map illustrating the migrations of the Mexicans.

## MICROSCOPY.[1]

AMATEUR MICROSCOPES. — The notorious success of Mr. Wenham, the late Mr. John Williams, and some other microscopists, in preparing their own apparatus, is exceptional only by reason of the degree of excellence attained. It is especially true of microscopists that they love the instruments they work with, and from this love follows not only the partially unfortunate "test-object fever," but also the eminently useful habit of studying, adapting, altering, and finally manufacturing accessories, if not instruments, suited to their needs and fancies. Such amateur work not only is the best possible drill in the science of the microscope, but also has added very largely to the development of the microscope of to-day. The European journals are full of interesting and profitable results from such work; while the readers of the NATURALIST have long been familiar with the contrivances and original constructions of a considerable number of American workers. Most microscopists, however, have confined their attempts to the production of accessories, believing, very judiciously, that the microscope as a whole could be more successfully made by more experienced hands. Of the comparatively few home-made microscopes, two recently published forms may serve as examples of the two extremes of ultra simplicity on the one hand and the best attained success on the other. In the form contrived by Mr. John Phin and described in his Practical Hints, the body consists of a tube of stiff writing-paper rolled several times around itself, pasted at the outer edge, and blackened on the inside. This tube slides, for focal adjustment, through another paper tube. A piece of looking-glass serves as mirror, and a demolished cigar box furnishes wood enough to make the remainder of the stand. A simple half-inch lens acts as objective, and a similar lens of two-inch focus constitutes the ocular or eyepiece. The lenses are held in place in the tube by means of the bottoms of pill boxes perforated to allow the passage of light, while similarly perforated pill boxes are placed in the tube in proper position to act as diaphragms to reduce aberration by cutting off stray light. Such a microscope, at a cost of fifty cents, is conceded to be too imperfect to use for scientific study or even for instructive amusement, its utility being not in the using but in the making of it. It is believed that a student by actually constructing such an instrument would gain a very clear idea of the essential parts of the microscope, as well as a good understanding of the faults of simple work and uncorrected lenses.

The more elaborate instrument referred to is described by Mr. John

[1] This department is conducted by DR. R. H. WARD, Troy, N. Y.

Michels in the last November number of the *Popular Science Monthly*. The essential parts of a microscope-stand are simplified and combined with great ingenuity and judgment. The form of stand is essentially that of the pocket microscopes of Swift and some other London makers, in which a single inclined bar, resting on the table at its lower end and supported by two legs near its upper end, carries firmly and conveniently the mirror, stage, and compound body. The blackened paper tube which serves as body is large enough to receive a good ocular or eyepiece at the top, and contains at the bottom a society-screw adapted to hold any objectives that may be chosen. It slides through a wooden tube lined with cloth, giving a good coarse adjustment. This wooden tube is glued, by means of an intervening piece of wood, to the main inclined bar of the stand. The stage is of wood, or gutta-percha modeled into shape while warm, also attached by means of a block of wood, and the object slide is held in position by elastic india-rubber bands. The mirror and its immediate mounting is that of a common student's stand. This instrument stands nearly fifteen inches high when in use, weighs one pound, and can be packed within a space fourteen by three and a half by three inches. It is perhaps the best amateur microscope that can be made at the present time by a student of average mechanical skill. One reason why it is the best is because it contemplates the use for all its optical parts of first-class professional work; for we cannot quite agree with its author that there is no reason why the student should not make his own lenses. Objectives have reached a degree of excellence which has quite outgrown the skill of an ordinary amateur. True, Mr. Wenham can make lenses of surpassing excellence, and so could Mr. Spencer, while still unlearned in the science and unpracticed in the art of microscopy, but such instances are so rare as not to compromise the accuracy of the statement that amateurs cannot make as good lenses as they can buy. Nor do we think that the author does full justice to the recent progress achieved (though still too little) by the regular makers in the way of furnishing good and useful work at an available price. What is called first-class apparatus is still prohibitively costly, and much of the cheap work is more than correspondingly poor; yet instruments can now be bought at a reasonable cost that would not be fairly described as characterized by "diminutive size, smallness of field, poor light, shortness of tube, absence of society's screw, and other evils" which "will soon cause" them "to be cast aside." Nor do we share the author's difficulty in finding lenses in this country which he can specially recommend. Most of our distinguished makers now prepare not only lenses of excessively high angle and price, but also lenses of exquisite workmanship, moderate angle, simple mounting, and available price; lenses which we recommend with double pleasure because of our strong faith in the utility of moderate angles for general use, and our firm belief that the perhaps neces-

sarily high cost of the high-angle lenses has materially retarded the growing popularity and usefulness of the microscope itself.

A Remarkable Forage for Bees. — Rev. J. L. Zabriskie, whose interesting papers on bee-bread, in the *Bee Keepers' Magazine*, have given readers unfamiliar with the sciences concerned a reliable understanding of the structure of pollen, and the curious development, upon the hind legs of the bees, of the pollen brushes and pollen baskets with which the pollen is gathered, loaded up, and carried to the hives, observed, during the last summer, bees coming to his hives loaded with an unusually large quantity of a pollen-like powder having a bright vermilion color, not before noticed. The pollen baskets were filled to overflowing with this novel food, which the bees were carrying to their hives and storing away in the usual manner. Microscopically examined the grains were unlike any known pollen, but corresponded exactly in their peculiar color, size, shape, granular contents, and character and delicate markings of the epispore, with the raspberry rust, which was abundant at the time on leaves in the garden and adjoining fields; this rust being a leaf fungus (*Uredo luminata*) whose delicate mycelial cells force themselves among and draw nourishment from the cells which form the tissue of the leaf, and which at the time of fruiting rupture the skin in little spots on the under surface of the leaf, and develop crowded clusters of bright red spores surrounded by the upturned edge of the ruptured leaf skin, which looks, when magnified, not unlike a little dish filled with miniature strawberries. The bees were not seen to gather spores from these clusters, but the grains carried to the hives were positively identified by comparison with fresh specimens from the leaves. This presumably unwholesome food seemed to have no unfavorable effect on the health of the infant families of bees. Whether some such strange choice of food is related to the occasional occurrence of poisonous honey, may be suggested.

Cryptogamic Parasites. — The report of M. Maxime Cornu, in the *Bulletin Entomologique*, on a larva of *Chelonia Hebe* which had been killed by a parasitic fungus, refers the fungus to the genus *Entomophthora*, and possibly to the species which preys upon flies in the autumn. The presence of this parasite in a larva he thinks has not been previously recorded. M. Cornu concludes that fungi cannot perforate healthy animal tissues, but must enter through some wound or other opening, since he has observed an Aphis of the elder infested even to the antennæ with an abundance of corpuscles of a species of *Entomophthora*, while the fifty-two young in different stages of development contained within the affected insect were all perfectly free and healthy.

Blood Globules in Typhoid Fever. — M. Cornil has found, in the blood of the spleen of patients who have died in the third week of typhoid fever, large numbers of white globules, inclosing red globules to the number of five, six, or even more in a single cell. Other cells in-

closed granules of hæmatosine. Although the existence in the blood of these large cells containing red globules is nothing new, nevertheless Cornil is the first to insist upon their multiplication in typhoid fever. The mesenteric glands, according to Cornil, are always inflamed in typhoid fever, in a manner analogous to the acute or subacute inflammation due to suppurative lymphangitis. — *The Medical Record, from Lyon Médicale.*

James W. Queen & Co. — This well-known firm has been once more dissolved, Mr. Cheyney carrying the department of philosophical apparatus with him to Bond Street, New York city. The remaining partners, S. L. Fox and W. H. Walmsley, retain the microscopical branch of the business at the old stand and under the old name. Microscopists will find G. S. Woolman in charge of their department at the New York store.

Raphides in Enchanter's Nightshade. — The *Bulletin of the Torrey Botanical Club* suggests sections of the enchanter's nightshade (*Circæa Lutetiana* L.) as an interesting microscopical study, the leaves, stem, and root being crowded with raphides, and the cells of the pith being filled with small transparent ball-like bodies.

A Polariscope Object. — Hairs of common gromwell (*Lithospermum officinale* L.) are said to polarize beautifully under the microscope.

## SCIENTIFIC NEWS.

— The following remarks by the editor of *Nature*, though referring to science in England, are not perhaps out of place in an American journal: —

"By looking to general science, again, the government avoids the difficulties which must necessarily accompany, with all the fluctuations of trade, any attempt to teach applied science except in some very general forms. The fact is that the practical applications of science bring their own reward, and need no extraneous encouragement; instruction and invention in them may very well, and without the least hardship, be left to those whose pockets they fill. Art receives ample encouragement, and is well rewarded by the nation; let but an artist in any department show himself capable of producing good work, and he will soon find that both the government and private individuals have plenty of rewards to bestow upon him. Science, on the other hand, receives not a penny in the way of assistance or reward, and yet the scientific investigator is the nation's servant and greatest benefactor. Pure scientific research is at present, like virtue, its own reward; the man who devotes himself to such research, unless he has some other means of gaining a livelihood, is likely enough to starve, for all the help he will get from his country; and yet, as it has been shown over and over again, our country's pros-

perity, the progress of nearly all our industries, and even the very existence of many of them, are dependent on the discoveries of the scientific investigator who pursues his research on purely scientific principles, and with no practical end whatever in view. Our country has got at least as much glory, and we venture to think more practical benefit, from achievements in the region of pure science, as from all that has been accomplished in the domain of art; and yet no helping hand is held out to those who are able and willing to do their country the highest service, but cannot, because they must drudge for a living. The domain of science is every day becoming more and more extended, her methods are becoming more and more complicated, and her instruments more and more expensive; in almost every department paths are being opened up which, if pursued to their end, would certainly lead to discoveries of vital importance to the best welfare and prosperity of the nation. Our public men are continually telling us that we are being outstripped by continental nations in fields which used to be peculiarly our own, and that simply because abroad every encouragement is given to scientific research, while here its existence is either ignored or it is regarded as a mere pastime."

— Dr. Oscar Grimm has published in Siebold and Kölliker's *Zeitschrift* a summary of the results of his investigation of the fauna of the Caspian Sea. The character of this assemblage of life has interest, says *Nature*, for the evolutionist as well as the geologist. It will afford evidence not only of modification of animal life, but also of successive changes in the physical geography of that region. Dredgings were carried on, by means of a steamer, down to one hundred and fifty fathoms, and an enormous quantity of specimens were obtained, including six new fishes, twenty species of mollusca, thirty-five species of crustacea, principally colossal forms of *Gammaridæ*, and twenty species of worms. The western part of the sea gives depths of five hundred and seventeen fathoms, and has a very abundant fauna; at one haul of the dredge in one hundred and eight fathoms, there were taken three hundred and fifty specimens of *Gammaridæ*, one hundred and fifty *Idothea entomon*, fifty colossal *Mysis*, etc. Eighty species in all are new to science.

— Professor Ernst Haeckel's work on The History of Creation, as translated by Mr. Van Rhyn, of New York, will be published early in the year by D. Appleton & Co. An English translation of Haeckel's Anthropogenie is soon to appear in London. Macmillan & Co. advertise a new edition of that choice work, White's Natural History of Selborne. They have also published A Course of Practical Instruction in Elementary Biology, by Professor Huxley and H. N. Martin (crown 8vo, 6s.); and Historia Filicum, by J. Smith, with thirty lithographic plates.

— A second meeting of those proposing to form a mountain exploration club, similar in many respects to the Alpine clubs of England and

Switzerland, was held January 12th at the Massachusetts Institute of Technology in Boston. Professor Pickering presided. Mr. S. H. Scudder, of the committee on organization, made a partial report, suggesting several names for the society or club, and defining its object to be the study of comparative geography and the scientific and æsthetic exploration of the highlands of New England and the adjacent regions.

— In Arctic Notes sent to *Land and Water* by an officer of the Pandora, the British Arctic exploring vessel, he says, "I would sooner eat seal's meat than mutton or beef." This is a little exaggerated, perhaps, but we can aver that seal's flesh has a relish to it after a day's dredging on the coast of Labrador, and a meal of boiled whale's flesh is good for a very hungry man. A well-seasoned mince pie made of whale's flesh would scarcely be distinguishable from beef pie.

— Professor Carl J. Sundevall, the venerable and distinguished ornithologist of Stockholm, has lately died. He left works on the morphology of arthropods and other subjects. The botanist, Professor F. G. Bartling, of Göttingen, died in November.

— The medal of the first class, with the diploma, awarded to Professor Hayden, in charge of the Geological Survey of the Territories, by the International Congress of Geographical Sciences which met in Paris in August, has been received through the state department. Professor Hayden has also recently received letters informing him of his election as honorary member of the Italian Geographical Society of Turin, Italy, and foreign corresponding member of the Geographical Society of Paris, France.

## PROCEEDINGS OF SOCIETIES.

Academy of Sciences, St. Louis. — November 15, 1875. Professor Riley remarked that among the changes that took place in those portions of the State so thoroughly devastated by locusts last spring, none were more interesting than the wide-spread appearance of a grass (*Vilfa vaginæflora*) unnoticed in ordinary seasons. The locusts eat down the blue grass so closely that in most instances it died out, and this annual grass takes its place and grows up rapidly just at the time when most needed by stock, so that it is considered a godsend by the farmers, who generally believe that it was brought by the locusts. The seed was scattered over the land the autumn before, and the conditions were all favorable for its starting. In ordinary seasons, on the contrary, it is smothered and choked down by other plants.

December 6th. Prof. C. V. Riley made a communication on jumping seeds from California, motion being imparted to the seeds by inclosed caterpillars of a small moth (*Carpocapsa saltitans*).

December 13th. A paper entitled The Grasshoppers and the Season of 1875 was received from Prof. G. C. Broadhead.

Professor Riley read a paper on the use of Paris green as an insecticide, reciting several important experiments, from which he drew the following conclusions: —

(1.) Paris green that has been four months in the soil no longer remains as such, but passes into some less soluble state, and is unaffected by the ordinary solvents of the soil.

(2.) When applied in small quantities, such as alone are necessary in destroying injurious insects, it does not affect the health of the plant.

(3.) The power of the soil to hold arsenious acid and arsenites in insoluble form will prevent water from becoming poisoned, unless the green be used in excess of any requirement as an insecticide.

He alluded to some of the potato-bug poisons, one of which, made up of salt and arsenic, was more dangerous than others, because it was liable to be mistaken for common salt.

January 4th, annual meeting. Prof. C. V. Riley was elected president. He remarked on a new use of the wood of the American agave, as a lining for insect-boxes, instead of cork. He exhibited strips of the wood, twelve by four inches, and one half inch thick, which answer this purpose admirably, the wood being remarkably light and porous, and pins being pushed into it with great ease and held firmly. It is much cheaper than cork. The celebrated traveler, Mr. A. R. Wallace, preserved all his valuable entomological collections in the East Indies in boxes made of pieces of this wood pinned together with thorns, and it is now coming into very general use.

Academy of Natural Sciences, Philadelphia. — December 28th, annual meeting. The curators announced that the new building erected for the academy was so far completed as to be ready for the reception of its collections. The removal of the museum from the building now occupied was commenced on the 2d of November and was completed last week. It is proposed shortly to commence the removal of the library, and the curators anticipate having the new hall ready for the future meetings of the academy early in January, 1876.

The concluding thirty pages of the Proceedings for 1874, and four hundred and twenty-seven pages of the Transactions, have been published, the latter being illustrated by twenty-four lithographic plates and ninety wood-cuts. One hundred and eighty-seven pages of the quarto journal have also been issued before the completion of the illustrative plates, as advance copies of Professor Cope's paper on the Batrachia and Reptilia of Costa Rica. The report concludes with a brief notice of the important events occurring in the history of the academy during the past year, which are stated to be the reception of the I. V. Williamson Library Fund, the sale of the premises at present occupied by the society, the removal of the collections to the new building at the southwest corner of Nineteenth and Race streets, and the junction of the American Entomological Society with the academy as a section thereof.

The librarian reports that there were nineteen hundred and forty additions to the library from January 1 to November 30, 1875, being an excess of two hundred and eighty for the eleven months named over the number received during the twelve months of the preceding year. Referring to the income at the disposal of the academy for the support of the library, the report continues, "At the annual meeting, held February 16th, the treasurer announced the munificent donation by Isaiah V. Williamson, Esq., to the academy, of ground rents to the amount of twenty-five thousand dollars as a permanent fund for the use of the library. It is confidently hoped that the interest on this sum, together with the portion of the interest derived from the legacy of the late Dr. Thomas B. Wilson devoted to the same use, and amounting together to eighteen hundred dollars per annum, will be sufficient, not only to keep the library supplied with the current scientific literature, but also to enable the library committee to secure, from time to time, the many very desirable books of an earlier date which are still wanting in most of the departments."

Boston Society of Natural History. — January 5, 1876. Prof. W. H. Niles read a paper on the evidence of a widely spread geological force, exhibited by certain rock-movements. Referring to the phenomena of spontaneous fracture and expansion of rock in a north and south direction in quarries at Monson, Mass., Groton, Conn., Berea, O., and Lemont, Ill., he inferred that they could not be due to local causes, but explained them by a north and south compression of the strata, due to the contraction of the earth, and showed the important bearing of the subject on the question of mountain-building. Mr. L. S. Burbank noticed some rare trees of the Merrimack Valley.

American Geographical Society. — December 6th. Judge Daly spoke on the progress in geographical research in Africa, with special reference to Stanley's recent explorations. He was followed by remarks from Mr. Bayard Taylor, who claimed that "Stanley's journey from Zanzibar to the Nyanza, and his exploration of the eastern shore of the lake, have never been surpassed for boldness, rapidity, and success by anything in the records of African travel."

Academy of Sciences, San Francisco. — December 20, 1875. *Darlingtonia Californica*, the pitcher-plant of the Pacific coast, formed the subject of a paper by Mr. Henry Edwards, who gave an account of its appearance, of its functions as a fly-trap, — though its digestive powers were questioned, — of the different insects entrapped by it, and of its distribution and habitat.

Academy of Sciences, New York. — December 13, 1875. Papers on A New Phosphide of Silver, and a Method of estimating Silver by Phosphorus, by Prof. W. Falke, and on a Direct Process in the Manufacture of Iron in Japan, by H. Newton, were read.

Cambridge Entomological Club. — December 10, 1875. Dr.

Swartz gave some account of the results arrived at in the Monograph of the *Rhynchophora* of the United States, soon to be published by Drs. LeConte and Horn.

Buffalo Society of Sciences. — December 17, 1875. A paper by Mr. Grote on Noctuidæ from the Pacific Coast of North America was read, and he remarked on a noctuid moth, *Polenta Tepperi*, from Texas.

Essex Institute, Salem, Mass. — December 6, 1875. Rev. Mr. Wright gave an account of the structure of Indian Ridge, in Andover, Mass., which he regarded as an ancient moraine.

## SCIENTIFIC SERIALS.[1]

The Geographical Magazine. — December, 1875. The Arctic Expedition, V. From Ritenbink to Upernavik. The Voyage of the Challenger, by Capt. J. E. Davis. N. P. Barbot de Marny's Geological Exploration in the Region of the Amu Darye. The Basin of the Mackenzie River. The United States Geological Survey in the San Juan Country. Stanley's Exploration of the Victoria Nyanza, by E. G. Ravenstein.

Monthly Microscopical Journal. — December, 1875. On a New Method of measuring the Position of the Bands in Spectra, by H. C. Sorby. Note on the Markings of *Frustulia Saxonica*, by J. J. Woodward. The Slit as an Aid in measuring Angular Aperture, by R. Keith.

Archiv für Naturgeschichte. — On the Genital Apparatus of Spiders, by Dr. Bertkau. Natural History of the Hydrachnidæ, by P. Kramer. On the Budding of Cuninæ in the Stomach of the Geryonidæ, by B. Uljanin. Description of a Fin Whale, by G. Zaddach.

Zeitschrift für wissen. Zoölogie. (Siebold and Kölliker, editors). — November, 20, 1875. The Development of Sponges, by Oscar Schmidt. Researches on the Hexactinellidæ (Sponges), by W. Marshall.

American Journal of Science and Arts. — January. Description of some Remains of an Extinct Species of Wolf and Deer from the Lead Region of the Upper Mississippi, by J. A. Allen.

Bulletin de la Société de Géographie. — November, 1875. The Madeira and its Basin, by L'Abbé Durand. Terra del Fuego, by G. Marguin.

Journal de Zoölogie. — No. 5. The Unarmed Gephyrea, by H. Théel. The Reindeer of Prehistoric Times, by P. Gervais (the editor).

Revue Scientifique. — November 27. The Genital Organs of Decapod Crustacea, by P. Brocchi.

Globus. — No. 23. Antiquities from Utah and California.

Nature. — December 9. Eskimo Tales and Traditions.

[1] The articles enumerated under this head will be for the most part selected.